THE INTERNATIONAL ENGINEERING CONGRESS.

An International Engineering Congress, held under the auspices of the American Society of Civil Engineers, will begin its meetings on Monday next, the third of October, at the World's Fair, St. Louis. Eleven years ago, at the time of the World's Fair at Chicago, a similar congress met, and now we are to have, in the papers which will be presented at this meeting, a review of engineering progress throughout the world during the intervening decade. Such gatherings as this and its predecessor are of more value to the engineering profession than is apparent at once from a casual glance over the long list of subjects which are to be considered by the various sections. They are the means of bringing together the most eminent engineers from all over the world, and, just as the national engineering societies promote among their members a feeling of pride and dignity in the pursuit of their profession, so does an international congress of this kind promote as well a spirit of co-operation and friendly feeling which is of quite as much value as the mere interchange of technical information which takes place during the discussions.

The Chicago congress was held under the auspices of the three national engineering societies of the United States: the Civil Engineers, the Mechanical Engineers, and the Mining Engineers. The Institute of Electrical Engineers was not then in existence. In fact, the science of electricity was at that time hardly out of its infancy, and but little attention was paid to electrical subjects. This year's general congress is to be held under the auspices of only one of the engineering societies, and, naturally, the subjects which will be discussed are more or less limited to the scope of civil engineering. An electrical congress has already been held in St. Louis and was attended by the world's most eminent electrical scientists and engineers. The mining and mechanical engineers have not seen fit to encourage a gathering of this kind, this year, so that, in a sense, the Chicago congress will be remembered as having a broader significance than the congresses at St. Louis in 1904.

The American Society of Civil Engineers has drafted its most distinguished members to direct the work. Each of the men who have been appointed chairmen of the seven sections are men who have world-wide reputations as engineers and are experts in those branches covered by their respective sections. The committee in charge has wisely placed no restrictions on those who may take part in the work of the congress and invitations have been given to all engineers regardless of their affiliation with any organization or engineering society. Undoubtedly a large number of those who participate in the discussions will be men who have no connection with the American society.

The meetings will fill six days. On the first day there will be a general meeting of the congress, and on the four succeeding days each of the sections will hold separate meetings for the discussion of the topics included under their titles. On the last day there will be another general meeting. By this arrangement each section will have four sessions of from two to three hours each for the discussion of its own papers. Ten or 12 hours seems a ridiculously short time in which to consider even a few of the many papers which have been promised. Under section A, Waterways, for example, there are to be 25 papers, each of which might well be the subject of a long and profitable discussion. As in almost every other convention, or meeting, of this kind, those in charge have been too ambitious. It will be a physical impossibility to get through with the long list of papers in the short time which has been allotted, and many must be left practically untouched.

The international character of the congress is evident from the list of authors of papers which will be presented. American engineers by no means predominate, and nearly every country in Europe is represented, with the noticeable exception of Germany. Japan and the Argentine Republic are among the comparatively new members of the family of nations which will have representatives in attendance. A large delegation from the Institution of Civil Engineers of London has already arrived, and members of other foreign engineering societies as well. These visitors are inspecting engineering works in some of the principal cities, taking the opportunity of the congress to see the best examples of engineering progress in the United States; and they will meet our greatest engineers. They will not be disappointed in the things that they see.

The pamphlet on ventilation of passenger cars, which the Pennsylvania Railroad has just issued, is an important addition to technical literature. The experiments which it describes constitute a distinct addition to railroad knowledge, and in equipping hundreds of its cars with adequate fresh-air intakes the road has put itself ahead of all others in this respect. The studies here reported are important not so much on account of any strikingly original facts brought out as because the subject is dealt with in a comprehensive way. Railroad men and inventors innumerable have dabbled with car ventilation, and many of them have written useful essays, but very little progress has been made. It remained for the expert engineers of a strong railroad company with a persistent policy, to "round up" the true theories and put them into practice extensively. Elsewhere in this issue the method and apparatus which have finally been adopted are quite fully described. The experiments have extended over ten years. The plan seems to be as near the ideal as it is possible to get. The supply of fresh air is always adequate, and it is distributed throughout the length of the car. The currents do not come in contact with passengers, yet, at the same time they go to every part of the car. But little dust and dirt and practically no cinders are carried in from the outside, and in the winter the cold air is warmed and dried by contact with the steam pipes before it reaches the inside of the car. It is hardly necessary to say that this arrangement has been finally approved by the Pennsylvania Railroad only after exhaustive tests to determine its behavior under the most severe conditions.

August Accidents.

The condensed record of the principal train accidents which occurred in the United States in the month of August, printed in another column, contains accounts of 16 collisions and 24 derailments. Those which were most serious, or which are of special interest by reason of their causes or attending circumstances, occurred as follows:

		Killed.	Injured.
7th.	Eden, Colo.	94	3
8th.	Plainfield, Ill.	..	20
8th.	Spottsville, Ky.	4	0
9th.	Chicago, Ill.	5	7
12th.	Dunlo, Pa.	1	0
14th.	Silverpoint, Tenn.	1	25
17th.	Altamont, Mo.	2	15

The disaster at Eden, Colorado, resulted in more deaths than were ever before reported in a train accident in the United States. More distressing circumstances have occurred in connection with hundreds of collisions and derailments, particularly those accompanied by fire and those where the victims have been scalded; but measuring solely by figures Eden now heads the list. If we could estimate the suffering it would no doubt fall far below many other cases, the proportion of injured to killed being as 1 to 30.

The circumstances of this accident were reported in the *Railroad Gazette* of August 12, page 226. Both the conductor and the engineman having been killed all questions as to possible errors of judgment on their part must go unanswered. The indications that the train was moving slowly are believed to afford evidence that the men in charge were watching for danger; but the only assurance we have that they watched with reasonable intelligence and caution is their long experience and good record. Unfortunately, men of experience and reputation make mistakes of judgment; and, moreover, they often get into a state of mind where they do not fear danger so much as they ought. Perhaps this is inevitable. The man possessed of the ideally cautious temperament required by the usual railroad rules might not be a success as an express engineman.

Quite likely Colorado becomes the scene of the worst train accident on record because she has more dangerous conditions than exist in the Eastern States, where our past records have chiefly been made. The suddenness of the "cloudbursts" in the Rocky Mountains, and the large volume of water with which they fill dry channels are different from anything that is to be found in more level regions. Indeed, one of the criticisms passed upon the railroad company is that it has been too ready to fill important official positions with men from the east, displacing men who have had experience in mountain railroading. Disasters like Eden have been predicted by old railroaders acquainted with that territory. The road has also been criticized for having too few telegraph offices, one near the Eden bridge having been closed not long ago. With this is coupled the statement that on a week day the track-repairmen might have been on duty near the bridge and have prevented the train from going upon it. It is obvious that if the safety of trains depends on track watchmen, Sunday trains deserve as complete protection as is accorded week-day trains. It is said that the men in charge of the northbound passenger train which had passed over the bridge a few minutes before the disaster did not notify the superintendent that the water was high, because there was no telegraph operator on duty at the station where they would naturally have left their mes-

sage; but this does not explain why they did not stop the southbound train and warn it.

We recount these circumstances, supplementing what has been printed before, for the purpose of suggesting the more important elements of the problem of prevention. To particularly define the problem would require a study on the ground. To settle it perfectly may be impossible. Look for a moment at what is demanded: a bridge high enough and long enough to pass a flood which can be only roughly estimated; a section master who will unerringly order out track watchman at any and all times when necessary, never hesitating a minute; a station agent who will discern the signs of the sky unfailingly and report promptly to the train despatcher; a despatcher who will run no risk, yet will not hinder trains unnecessarily; and finally conductors and enginemen who will be cautious in the extreme yet will "get their trains over the road" to the satisfaction of the superintendent. To comply with all these conditions a railroad company must not only have experienced and well trained men but must have a good volume of traffic to pay the bills. The only alternative is very low speed for all trains, with the understanding that delays must be expected.

There was one serious passenger train wreck in Canada in August; a butting collision near Richmond, Quebec, on the 31st, killing nine persons and injuring 23. This collision appears to have been due to careless reading of the train register. The coroner's jury which investigated the accident brought in a verdict which says that confusion is likely to occur, through the fact that two trains bearing the same number, arrive on the same track at nearly the same time [from different divisions], and that "train registers, besides being kept distinctly apart from each other, should be checked by some special official." The Montreal *Star* says: "These recommendations are good, but why should it be necessary for such simple precautions to be suggested to railroad experts by a coroner's jury and as the outcome of a lamentable disaster?"

The next day after the Richmond collision there was one nearly as bad on the Canadian Pacific at Sintaluta, 300 miles west of Winnipeg, due to a misplaced switch at the entrance to a side track. In this collision five passengers were killed. Concerning the Sintaluta case the Montreal *Witness* says:

> In the Richmond disaster, the Sintaluta wreck, and the many other 'accidents' there is work for the Railway Commission, not only of investigation, but of founding upon the evidence it receives a stringent set of regulations, with heavy penalties for disobedience of the same. The Railroad Commission, too, would find it a good subject for investigation as to how far it is true that certain railway officials wink at disobedience to the rules on the part of the men as long as there is not an accident. The men will assure you, on some railways, that the rules are all right if the men were permitted to live up to them. But an engineer who followed the rules exactly would make bad time, and would (so they say) be 'pulled' from his engine for a week or a month as a punishment. They therefore 'take chances' and disregard rules with the knowledge of the officials. . . . Another thing in which reform is needed is in the inquiry by a coroner's jury. Many people would, indeed, to-day, in all cases of seriousness, abolish the coroner's jury altogether. The services of the jurymen are naturally given grudgingly, as it is forced and unpaid labor; the jury is inexpert and haphazard in receiving and rejecting evidence and in arriving at conclusions. Half the time there are no conclusions, and the other half the conclusions of a jury are not carried into effect. If all railroad accidents were investigated by a commission of experts, as in the case of wrecks at sea, and the blame duly apportioned, that would be a step in the right direction; but a step which should keep it close companionship would be one by which adequate punishment should follow criminal negligence, however, 'high up' the criminal might be. Various attempts have been made to pass legislation having this purpose, but railway influence is strong at Ottawa on both sides of the House, almost every member enjoys direct favors at the hands of the railway, and nearly all such legislation is blocked. The most of these slaughters could be prevented if legislators were determined."

The number of electric-car accidents reported as occurring in the United States in August was 23, in which 13 persons were killed and 203 injured. One of the deaths and six of the injuries are charged to a runaway on a curve, due to the failure of a brake chain; a collision at a crossing, injuring six persons, was due to a failure in hand signaling, and 35 injuries are charged to a collision near Pittsford, N. Y., said to have been caused by the attempt of a motorman to "steal a switch."

Elsewhere in this issue will be found an extract from a paper read before the National Railroad Master Blacksmiths' Association held at Indianapolis, on oil burning furnaces in the shops of the Southern Pacific. This extensive use of oil burning furnaces is to be commended. Although the coal heated furnaces and forges are comparatively inexpensive and use the cheapest fuel, they require men well trained in judging heats, etc., to operate them. The efficiency of coal furnaces depends upon the skill of these men, and this skill can only be acquired after a long experience; consequently, these men demand high pay. The operation of an oil or gas furnace is a comparatively easy matter when compared to the operation of a coal furnace, and when properly designed for special work these furnaces are not only economical but are more efficient, convenient to handle and speedy of operation. Besides this, it has been demonstrated that metal heated in an oil furnace is more homogeneous, is freer from seams, and is more pliable after forging than metal heated in a coal furnace. Although oil is an improvement over coal as fuel for furnace work, it is claimed by many that still better results can be obtained by the use of gas as fuel. By the use of gas the temperature of a furnace can be controlled to a greater nicety than with any other form of fuel. The science of metal working has progressed to such a point that it is pretty generally known even in the blacksmith shop that the temperature of the metal during working bears an important relation to the several elements which made good forgings. It is unquestionably true that, in most cases, it costs more to operate a furnace with oil or gas than with coal. Of course, local conditions and proximity to oil or gas fields is the prime factor in cost of fuel. But even assuming that the use of oil or gas costs more than coal, it nevertheless follows that the higher grade of work produced, the increased output, the greater ease of operation, etc., more than offset the extra fuel cost.

It is announced in Boston that the New York, New Haven & Hartford is going to abandon electric traction on that part of its Nantasket Beach line which is used also by steam locomotives. It will be remembered that this part of the line was electrified some years after the establishment of the original Nantasket electric line. The present announcement has elicited numerous inquiries as to the intentions of the company in regard to the use of the loop tracks in the lower level of the Boston terminal station, and President Mellen has frankly told the people of Boston that they need not expect to see electric cars at the terminal for some time to come. The terminal station has now been in use about five years. The loop tracks, idle all this time, were built in the expectation that electric motive power would soon be sufficiently perfected to warrant the company in adopting it for use on the suburban lines within 10 or 15 miles of Boston, but this expectation is not yet realized. The gist of Mr. Mellen's message to the Bostonians appears to be that when electric motive power has been tried and made successful at the New York end of the road, it will be adopted at Boston.

President Mellen's Report.

The coming, a year ago, of President Mellen, of the Northern Pacific, to the presidency of the New York, New Haven & Hartford, was a noteworthy railroad event; not only because of the personality of a successful manager but also the unique character of the establishment of which he was to assume charge. The New Haven Railroad was last year 54 years old; it was and is a territorial monopoly; it has been an extremely prosperous corporation. But, in operation it had been defective, even reactionary. There had been no broad and farsighted freight policy; and public sentiment toward the road was not too kindly.

The first annual report of President Mellen now lies before us. He has had to deal with varied and hard problems. There was (1) the full development, so long and carelessly neglected, of freight carrying capacity. The train load had to be increased and Mr. Mellen's Northern Pacific "idea" adapted to New England soil. New cars and engines had to be bought and, to use them, bridges had to be replaced; and terminal grounds acquired, and sidings increased.

There were (2) electrical questions fronting Mr. Mellen in varied and complex shapes. He inherited with the corporation seven electric lines (200 miles of track) bringing in about $700,000 of gross receipts. Some of these, like the Hartford-Bristol line, were profitable, and others, like the Nantasket branch, were essential failures. There were original ventures, such as the self-parallelism of the Norwich & Worcester by the electric road southward from Worcester for some 40 miles into Connecticut. But beyond lay the much more ominous schemes of long distance parallels of combined electric roads, potentially both freight and passenger carriers. This last was much the gravest phase of the many-sided electric proposition.

There was (3) the matter of public sentiment and the attitude of the somewhat heterogeneous New England communities toward the road and bearing directly on its responsibility as a monopoly—a subject closely connected with legislation, neglected suburban development and multiplied branches of public necessity and convenience.

Coming now to the report itself we may fitly refer to its points of information as they apply to the three foregoing heads. Taking up the question of freight development President Mellen outlines results and plans as follows: Many additional side tracks and increased yards; progress in the double tracking of the very profitable Naugatuck railroad; new equipment to the amount of $7,326,781; the Bridgeport four-tracking costing up to date some $4,000,000, with its elimination of many grade crossings; elimination of grade crossings at Fall River; renewal of 107 bridges to standardize the line for heavy traffic; the purchase of the real estate required for two additional tracks through the city of New Haven, giving room for easing grades and curves and increasing head room; and, finally, the purchase of the Central New England road, including the Poughkeepsie Bridge. These are the most important of many improvements in the direction of enlarged freight traffic; and of those which we have enumerated the last three are by far the most suggestive. That President Mellen would attack instantly the road's old defect in rolling stock was to be expected. The enlargement of the New Haven cut, which will cost not less than $1,000,000, will remove a danger point where a comparatively trifling accident would block

almost the whole business of the company; and as to the Poughkeepsie Bridge purchase we may quote the President's own words when he says: "It will be the policy of the company to handle its through freight business by way of the Poughkeepsie Bridge to avoid the delays and expense incident to the present route by way of New York harbor, and the relief afforded the New York Division will enable a more profitable business to take its place." But the purchase of the Poughkeepsie Bridge means a good deal more, which can be read between the printed lines. It forecasts, almost as a surety, future connection with the coal fields —either by a direct line or by an indirect but more expensive scheme of a kind of belt line intersecting the great coal roads. This will be a very costly undertaking but we cannot doubt that it is contemplated. While not mentioned in the report, there should be noted among the changes of bridges for heavier traffic, the prospective early rebuilding of the large Cos Cob, Westport, Housatonic and Warehouse Point structures, and the strengthening of the great bridges at Lyme and New London.

New York, New Haven & Hartford.

The western terminus of the Central New England is at Campbell Hall, 30 miles west of Poughkeepsie.

Changes of the kind, though costly and requiring probably two years of time, doubtless commanded quick approval by the directors, as bringing, after completion, immediate returns in net revenue.

The company's electrical policy is touched upon in the most meagre fashion. Brief reference to the great suburban scheme between Harlem River and Portchester with its prospective outlay of many millions; the purchase for $9,666,700 of the Fair Haven & Westville system; the creation of the "Consolidated Railway Company" for control of the electric lines; and a brief word about the financial results of the Fair Haven investment—these short references cover all that Mr. Mellen has to say on a subject which is financially momentous. They mask a plan of concealment which only serves to accent the importance of the thing concealed, and we must again read between the lines.

President Mellen inherited from the Clark-Hall administrations electric properties aggregating 200 miles of track and with annual receipts of about $700,000. His corporation now owns or controls electric properties that include about 350 miles of track and with annual gross receipts of almost $2,000,000. In actual value the electric roads taken in by President Mellen have well nigh trebled the holdings of the corporation. To the Fair Haven & Westville system, it must be recalled, are to be added the Norwich and New London plants, absorbed a few weeks ago and not technically falling within the scope of the report. The effect of the Norwich-New London acquisition is three-fold (1) to thwart any long-distance competition along the shore line; (2) to supply a natural terminal for the company's own electric parallel from Worcester toward Norwich; and (3) when the latter line is pushed through to Norwich to enlarge prospectively the summer excursion business.

In connection with electric expansion should also be noted the accomplished feat of the company of "blanketing" its electric properties under the old Peoples' Tramway charter with its liberal, not to say excessive, powers. By this device the trolley properties in Connecticut are unified and refinanced and room is left for enlargements.

When President Mellen took office in November, 1903, his electric policy was nebulous and he, himself, non-committal. The events of the last five months show clearly that he has taken up the radical policies of his predecessors and gone them many points better; that he is committed to the theory of electric expansion on a large and most progressive scale; and that his company is probably to be bracketed with the New York Central as an American pioneer in the adaptation of electricity to fast and heavy trains, with ultimate gathering, entrainment and redistribution of local passenger traffic. President Mellen does not say all this in his report, but he has said it in effect so often unofficially as to give it official sanction.

In his relations to public sentiment and to the communities along his lines President Mellen has been unfortunate. He took office just at a juncture when public feeling against the road needed, if possible, to be propitiated. Partly as the result of poor coal bought by his predecessor during the anthracite strike, partly in consequence of the bad condition of locomotives, passenger service had become irregular; and an advance in freight rates ordered by President Hall—closely connected with increased wages and demurrage charges—had made the company anything but popular with shippers. If welcomes at board of trade feasts and the compliments of after-dinner oratory could have sufficed, the new president would have been superlatively *persona grata* in southern New England. But the railroad fates sardonically thwarted the best of intentions. The savage winter of 1903-4 kept the service irregular; in the face of falling earnings and the necessity of maintaining dividends on stock increased some $16,000,000 by conversion of debentures and $9,000,000 for the other reasons, the President not only could not give long-demanded improvements in suburban service but was forced last summer to withdraw many trains; and the combination of cheap excursion travel with regular trains has not been pleasant to regular passengers. The wave of unpopularity which has swept against the company and its head will probably be transient, but it certainly is broad and deep. Its most serious aspect is its bearing on legislation next winter when the company seeks for modification of the Connecticut four-days' car detention law.

Turning to the fiscal side of the report we tabulate, omitting cents, some of its more important entries in comparison with last year.

	1904.	1903.
Miles operated, June 30...	2,031	2,037
Gross earnings.	$48,282,909	$47,296,078
Passenger earnings	23,425,173	22,953,018
Freight earnings	24,413,541	23,926,150
Miscellaneous earnings..	444,195	416,909
Passengers carried	63,130,459	63,714,199
Passengers carried 1 mile.	*1,135,702	*1,114,313
Rate per pass. per mile....	1.725 cts.	1.729 cts.
Freight (tons) carried....	17,560,485	18,283,733
Tons carried 1 mile	*1,661,382	*1,627,858
Av. No. pass. in train.....	71	71
Av. tons freight in train...	208	218
Operating expenses	$35,159,211	$34,955,024
Maintenance of way, etc..	5,467,201	6,237,722
Maintenance of equipm't	4,703,873	4,189,919
Conducting transportation	23,911,347	23,587,106
General expenses	1,076,790	940,276
Net income	14,030,134	12,906,871
Interest on bonds	779,667	1,137,052
Other interest	279,993	52,912
Rentals	4,420,283	4,504,546
Taxes	2,455,434	2,385,390
Eight per cent. on stock...	6,006,448	4,618,438
Assets	136,436,894	114,971,686
Road and equipment....	61,363,137	61,809,871
Stocks of leased lines...	16,394,092	14,399,292
Stocks and bonds	25,542,994	9,757,468
Miscellaneous	33,136,671	29,005,055
Liabilities	136,436,894	114,971,686
Capital stock	80,000,000	70,897,300
Paym'ts on new cap. stk	.....	8,325,780
Conv. debenture certs....	185,300	185,300
Funded debt	9,639,000	4,364,000
Debentures not convertible	24,666,700	10,000,000
Miscellaneous	7,296,857	7,969,740
Profit and loss	14,649,037	13,819,566

*000 omitted.

NOTE.—The gross earnings of the steamboat lines were $4,591,145 in 1904, as compared with $4,668,031 in 1903.

The increased funded debt is to be set off chiefly to the purchase of the New Haven trolley roads and of the Central New England. New stock to the amount of $1,994,800 was issued for stock and bonds of leased lines, perpetuating the old policy of consolidating the system.

Probably for prudential reasons connected with the labor unions President Mellen makes only the briefest allusion to the strikes on his system; but they were no small factor in his first year's troubles, and his firm and successful stand on principle against the strikers in his marine department is a feature most creditable in his record. No returns are given of the results of operation of the electric roads; and none of the operation of the Sound steamers, except in the note quoted above. Both are now integral parts of the system and fuller statements should be made, both for the shareholders and the public. As to the general administration of the property the former, at least, have grounds for deep satisfaction that, through many hardships, their President has been able to sustain their dividends.

President Mellen began his official work

early in November of last year. His first report, therefore, covers formally but eight months of his administration; and a period of 11 months shows his administration and policy down to the present time. But the year, though incomplete, has been long enough to be singularly picturesque, not to say dramatic. When a new railroad President is compelled to front in his first twelvemonth the hardest New England winter of half a century; labor troubles of a peculiarly complex and vexing character; reconstruction on a great and costly scale; the absorption of a new steam railroad system; the definite adoption of an electric policy involving the vital "yes" or "no" on the question of absorbing extensive plants—when to these is added a sudden and unlooked for falling off of business in the territory served, and reduced train service arousing public anger and antagonism—then such a railroad administrator surely has had his full share of hard experience in ratio to time of service. The fulfilment of President Mellen's large plans is not yet, and probably years must pass before even one of them is compassed fully. It is a time of radical transition in the history of a remarkable railroad which has been prospered in past years, almost in spite of itself. But, whatever the outcome, the first year of President Mellen's headship has had a fertility of incident and a pace in the evolving of policies which leave even the liveliest years of President C. P. Clark far behind.

Lehigh Valley.

The Lehigh Valley produced in the year ending June 30, 1904, a net income of $5,112,000, equal to 12.6 per cent. on the capital stock, and $3,104,000 larger than the year before. The income account shows:

	1904.	1903.	Increase.
Gross earnings	$29,881,738	$26,654,503	$3,227,234
Op. expenses	18,870,301	18,980,179	*109,878
Net earnings	$11,011,436	$7,674,323	$3,337,113
Other income	505,477	637,592	*132,115
Total income	$11,516,914	$8,311,916	$3,204,998
Deduction.			
Adtns. & betrmts	$1,465,290	$1,266,182	$199,108
Interest	2,779,110	2,806,925	*27,815
Rents and taxes	2,984,286	2,950,546	33,740
Miscellaneous	32,667	176,673	*144,004
Tot'l deduct'ns	$7,261,353	$7,200,326	$61,026
Net income	$856,437	$895,918	*$39,481

*Decrease.

If we restore additions and betterments to earnings we have a surplus for the year of $6,577,287, which is 13.8 per cent. on the stock. If these figures do not have to be qualified on closer examination of the way the income account is made up, the results for the year are most pleasing.

Five factors contributed to the results of the year. First.—A large increase in the total freight traffic. Second.—An increase in the average rate. Third.—A decrease in expenses. Fourth.—A decrease in other income with an increase in deduction. Fifth.—An increase in the profits from coal mining. The first two and the fifth factors are traceable to the same cause, namely, the increase in the coal business. The decrease in expenses is an operating matter while the decrease in other income is largely due to loss by the operation of water lines, probably caused by the strike on the lakes in the early part of the season. The increase in coal tonnage accounted for the larger volume of total freight traffic, the merchandise traffic showing a decrease of 6 per cent. The larger proportion of anthracite coal traffic, which is profitable, caused the redistribution of tonnage that increased the ton mile revenue from 5.98 mills to 6.37 mills, or about 5 per cent. Dismissing the commercial side of operations and passing directly to expenses we come upon the central feature of interest. On the face of it Lehigh Valley shows a decrease in expenses with an increase in business, while almost all other roads so far reporting, barring a few notable exceptions, show an increase in expenses, generally large, and with or without an increase in business. But we find that this net decrease in expenses of a round $110,000 came about by a decrease in maintenance of a round million, and an increase in transportation expense of $900,000. In this view the decrease in expenses is a different matter. The amount withdrawn from maintenance of way was about 25 per cent. of the expenditure in the preceding year. This is not necessarily a basis for criticism but it entirely restates the significance of the decrease in expenses.

From the operating standpoint the increase in cost of conducting transportation is noteworthy. The entire volume of freight traffic increased about 7 per cent., while transportation expense increased 10 per cent. The year was marked by an unusually severe winter, but the expense of the year previous with which the comparison is made was itself very heavy. More than that, the heavy outlay of the year and past year for better roadway, more modern power and larger cars, and the larger proportion of coal tonnage, which is cheap to handle, are offsetting factors which should in very large degree compensate for a hard winter. The transportation officials were able to add only about a half ton to their train load. Improvement is usually to be expected in transportation results by the mere process of growth, and from the use of constantly bettered facilities; and the absence of such improvement is in itself a matter of remark.

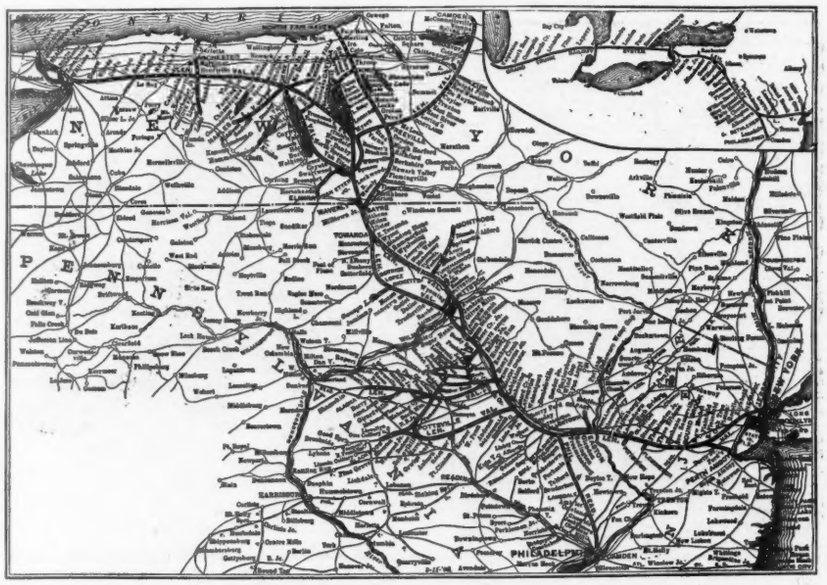
On the whole the financial outcome of the year is good, but it is not as large as appears from the income account. The contributing factors that are largely due to outside causes have been favorable. The factors within the control of the management, as far as they have had result, have contributed to reduce the advantage gained from outside causes.

Some of the more important statistics are as below:

	1904.	1903.	Inc.
Average miles operated.	1,392	1,392	....
Gross earn'gs,mile of r'd	$21,456	$19,146	$2,310
Freight earnings	24,829,777	21,714,471	3,115,306
Passenger earnings.	3,155,715	3,191,639	*35,924
Pass. miles, thousands	182,373	170,118	12,255
Passengers per train	48.8	45.1	3.7
Pass.-mile, revenue	1.73c	1.87c	*.14c
Ton-miles, thousands:			
Coal	1,765,612	1,360,804	404,808
Freight	2,130,890	2,271,677	*140,787
Total	3,896,502	3,632,481	264,021
Tons per train	486.15	485.52	.63
Ton-mile, revenue	.637c	.598c	.039c
Frt. train mile, revenue	$3.098	$2.902	$0.196
Av. haul, miles	177.8	182.3	*4.5

*Decrease.

On June 29, the directors declared a dividend of 10 per cent. upon the preferred stock, and a dividend of 1 per cent. on the common stock. This dividend was not payable until August 1, and therefore does not appear in the report. As there is now outstanding $40,334,800 of common stock and $106,300 of preferred stock the combined dividends amounted to $404,411. Subtracting this sum from the total net income of $5,111,997 shown in the report there remains a net income of $4,707,586.



Lehigh Valley.

Lehigh Valley is especially interesting to operating officers, because it has been put through a severe process of rehabilitation. Prior to 1893 the road was one of the most prosperous in the country. Asa Packer, the father of the property, had dominated its policies for years, taking the public into his confidence very little. As an old canal boat-owner on the canal that carried anthracite coal to market his first conception of the railroad which he had built was as an outlet to his coal mines. He yielded awkwardly to the logic of events which forced the extension of his line across the State of New Jersey to tidewater at New York. When President Wilbur succeeded to control, the established traditions were but little changed. The road was extended to Buffalo on the west and fell into its place as one of the trunk lines; but its established dividend rate was too high and all the fixed tendencies of a generation of isolated growth swept it on to the inevitable break when dividends were suspended and prosperity paralyzed.

After a few years of aimless policy the road fell into New York hands, and Mr. Al-

fred Walter was put in charge. President Walter came to his task with the rich equipment of a Pennsylvania apprenticeship, widened and made available by experience as general operating officer on the Baltimore & Ohio and the Erie. With a vigorous mental grasp and a forceful personality, he conceived and executed on masterful lines. His financial backers did not come forward with the money which the property sorely needed for its renovation, and he was forced to draw it from earnings. Having become convinced as to the only possible policy, he set himself to its execution with a singleness of purpose and devotion to his trust, from which neither clamor nor pressure could swerve him. For six years he held inflexibly to this course and only yielded at last by resigning when the stockholders who misunderstood him could be patient no longer. For only six weeks of these six years did he in any sense have the pleasure of operating the property under some of the conditions he set out to create. But his wisdom and prudence have borne rich fruits. Achievements such as these lift the art of railroading to the level of a profession.

President Thomas, with his great experience, discretion and energy, has taken up the work with vigor as it was left by his predecessor, and while carrying forward the plan of physical renovation has won again the confidence of the stockholders. He has worked out a plan of financing the property for many years to come. Lehigh Valley after its long period of suspended dividends has by safe guidance come again to its own.

Lightning and Automatic Block Signals.*

BY H. S. BALLIET.

There are two kinds of failures of automatic block signals due to lightning; failure of signals to assume the stop position when the block section is occupied, thereby imperiling trains, and failure of signals to indicate proceed and the consequent delay to traffic.

Platinum was used almost exclusively for contacts on track relays until within the last five or six years. With these contacts there is danger of their becoming fused when lightning discharges of high potential and volume pass through them, thereby preventing the relay armature from dropping and opening the signal circuits, thus causing a clear signal to be improperly displayed.

Either plain commercial carbon or carbon

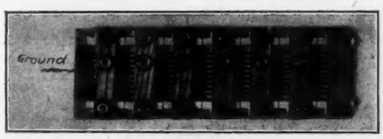


Fig. 1—Choke Coil.

with copper or silver plating (to reduce the resistance of the contact) is now furnished on all relays unless otherwise specified. These carbon contacts are seldom fused; only when the plating is too thick and a discharge of very high tension is delivered through them. To assist in meeting this latter contingency, the wires (commonly called spider wires) leading from the relay springs and fingers to the various binding posts are made of copper wire of .020 in. diameter (No. 20 B. and S.) which usually melts if subjected to a current of 18 amperes for five seconds, thus opening the circuit and guarding against a false signal indication, even though the point should become fused.

For the second class of failures—non-dangerous stoppages of trains due to open circuits—there are several causes. The most common is the destruction of the relay, the clutch or the signal magnets by lightning "burning out" the windings of the electro-magnet, thus causing the armature to open the controlling circuits. If fuses are used, they may or may not be "blown" or "burnt out" depending upon the amount of current delivered through them, their capacity and

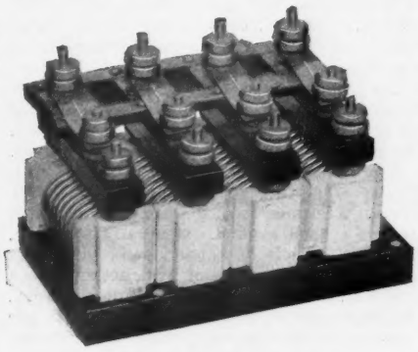


Fig. 2—Lightning Arrester.

the time required to burn them out. A line wire may burn off on account of the excessive discharge, or the spider wire on the relay finger and the springs may be burnt off. An effort is being made to intercept or "arrest" the discharge before it can reach these weak parts. There is at this time no absolute means of protecting these controlling mechanisms from heavy discharges. There are, however, in service a great variety of so-called "lightning arresters," and there is no doubt that each design has its own particular good point for certain special demands. I have tried a great many designs of arresters on automatic block signal apparatus, and at times it is difficult to definitely

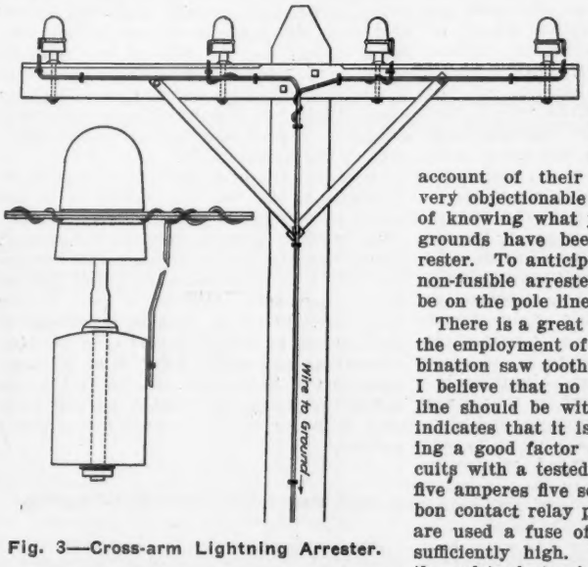


Fig. 3—Cross-arm Lightning Arrester.

state which is preferable. From a careful record for eight years the conclusion seems warranted that the comb or saw tooth arrester, if made so as to be compact and if mounted on a slate base (wood bases warp and close up the air gap) will divert the greater part of the discharge provided, of course, that the ground connection is satisfactory.

Much has been said about the weak points in choke coil arresters; but it must be said that such arresters are makinng for themselves wonderful records. If the ground connection is good and the ground wire of sufficient capacity to carry off the discharge not less than .085 in. (about No. 12), little or no abnormal current will reach the instruments.

The most efficient choke coil thus far tried is made like Fig. 1. If this arrester is properly mounted on a slate base with a large ground plate surface, and the windings around the porcelain and iron core are far enough from the ground plate to allow clearance for two sheets foolscap paper, very little discharge passes beyond the choke coil.

As it is not satisfactory to depend entirely on either the saw tooth or the choke coil arrester a new arrangement was designed, Fig. 2. This arrester combines both the saw tooth and the choke coil in one.

The arrangement now deemed the best available is somewhat on these lines: Bring the line wire side to saw tooth, from there to the choke coil and thence to the apparatus. Preferably the saw tooth should be connected to the rails, and the choke coil to the ground. This arrester has been known to divert 85 per cent. of the discharge when all conditions are favorable. Cases are on record (the arresters are still in evidence) where the discharge was so heavy as to melt off three or four .085 in. copper wires, which are wound around the porcelain and iron core, on account of the arcing to ground; while the saw tooth showed scarcely a burn. This is apparently due to the fact that there is a better path to ground than to track. In some cases it has been found that most of the discharge flows from saw tooth to track, causing a general derangement of the teeth, some being melted and entirely destroyed.

The principal objection to putting an arrester on a signal pole, signal or relay case is the liability of burning off the wires leading to the instruments, because the lightning passes through the arrester in an effort to complete the circuit. To place the arrester on the crossarm or near the top of the line pole—which is the old way—encourages maintainers to neglect close inspection on account of their inaccessibility. This is very objectionable because there is no way of knowing what points are fused or what grounds have been introduced on the arrester. To anticipate some of these evils, a non-fusible arrester is desirable. It should be on the pole line.

There is a great diversity of opinion as to the employment of fuses in addition to combination saw tooth and choke coil arresters. I believe that no circuit coming from the line should be without a fuse. Experience indicates that it is a happy medium affording a good factor of safety to fuse all circuits with a tested fuse capable of carrying five amperes five seconds; this if using carbon contact relay points; if platinum points are used a fuse of one ampere capacity is sufficiently high. With a five-ampere fuse the safety factor is always maintained, and not so many fuses are blown by sneak currents; and there are fewer train detentions due to blown fuses. When .020 in. wire is used for spider wires on relays, its carrying capacity is found to be too low for the five-ampere fuses and this wire must be .025 in. This does away with the annoyance of relay renewals except in case of a direct stroke of lightning.

No fuse wire should be allowed to remain

*Articles by Mr. Balliet on the performance of automatic signals under unfavorable conditions were published in the *Railroad Gazette*, of Feb. 26, March 25, April 15, May 20, July 1, July 8, Sept. 2 and Sept. 9.

in service over one year, because its resistance increases with age and it is liable to become very unreliable. The better plan is to select copper wire which will fuse at a point equal to that of the lead and alloy fuse wires above described, then the renewals never need be made. The connections holding this wire should receive a regular inspection the same as the rest of the apparatus. Then again this wire will not break so readily; the breaks in ordinary fuses are somewhat annoying.

Tests which have been kept up for three years indicate that it is unnecessary to apply fuses to track circuits, they only introduce unnecessary complications by increasing the resistance. Thus far this year, the Lehigh Valley has had four relay magnets, connected to track, burnt out in their windings; and in each case, there was a well defined mark left on the relay base, clearly showing that the discharge was from line to track.

For a number of years lightning played considerable havoc with relays because the discharge arced from the line finger across to the armature plate, to pole pieces of relay, thence to track. This has been anticipated by increasing the air gap between the points. Any number of relays have been ruined by lightning arcing from relay fingers attached to line, thence to the binding post connected with the track; this air gap has been increased and this source of interruption anticipated.

Before rain sets in, the path to the ground through the track is better than that across the great air gaps which exist in the connections to the ground wires.

In order to intercept the discharges which continually tend to flow to ground by way of the arresters, a new application of pole arrester was installed three years ago on a territory eleven miles in length, and the results are better than could have been expected. The arrester or lightning rod, Fig. 3, is constructed of .100 in. hard or soft drawn bare copper line wire. The wire is stapled to the telegraph pole and run to the ground. The crossarm is fitted with legs soldered to the main ground running parallel with the arm; and branch arms extend upward toward the line wire. These are also stapled firmly to prevent shifting. Every signal wire supported on the arm has a branch copper wire soldered to it. This wire is tied to the insulator to prevent shifting when high winds sway the wires and poles. This latter wire is run about ¼ in. below the bottom of the insulator, and is placed directly over the wire connected to the ground, being separated from it between ⅛ in. and ¼ in. These latter connections are attached to the main line wire before it passes around an insulator to be dead ended, or before the terminal leading to the relay or signal case. The object is to discharge as much of the lightning as is possible before it can reach the fuses and the apparatus. Lightning has arced this air gap so successfully that it was necessary to raise the lower leg and close the air gap thrice in one season on upward of 20 poles. The wires forming the arrester are cut diagonally so as to form a point, somewhat after the principle of a lightning rod point. These arresters are so placed as to average one set for every line wire about every quarter mile throughout the Lehigh Valley lines.

This new arrester is installed in conjunction with an arrester of the type shown in Fig. 2. The pole arrester is placed on its own ground, the saw tooth on track, and the choke coil on a separate ground. The territory where this protection is used is on top of a mountain, along its western slope, thence through rocky, then marshy country, into a coal district, through numerous glens and gulleys to the bank of a river. This territory has been visited by many lightning storms and there was a great deal of detention to trains by the burning out of fuses up to the time of the revision three years ago. In these three years, there have been no failures due to lightning discharges until two months ago when, as an experiment, the saw tooth and choke coils were cut out. During the time that these were out of service three relays were disabled by having their spider wires burnt off. The saw tooth and choke coils have been restored and no further trouble has been experienced.

It is found that track relays wound with .036 in. wire (No. 19) are very seldom burnt out owing to the high carrying capacity of the wire.

No ground wire should be of less diameter than .165 in., and all ground wires should be of copper. Iron rusts off at the ground line. All grounds should be inspected once a year.

There is much discussion about the difficulty of getting good ground wire connections. At times it seems almost impossible to get a good ground. Generally speaking, however, a coil of copper wire, about six turns with a diameter of 2 ft., set into good soil 6 ft. below the surface will do the work. In very poor or rocky soil, it is well to use charcoal or coke to more surely retain moisture. Grounds are made by driving galvanized iron pipes into the ground to various depths; this, like the 4 ft. wrought iron stake, is satisfactory only as a temporary ground. Some railroads have adopted standards for making grounds. These are not all alike, but all aim at the same thing—a connection to damp or moist earth about 6 ft. below the ground line.

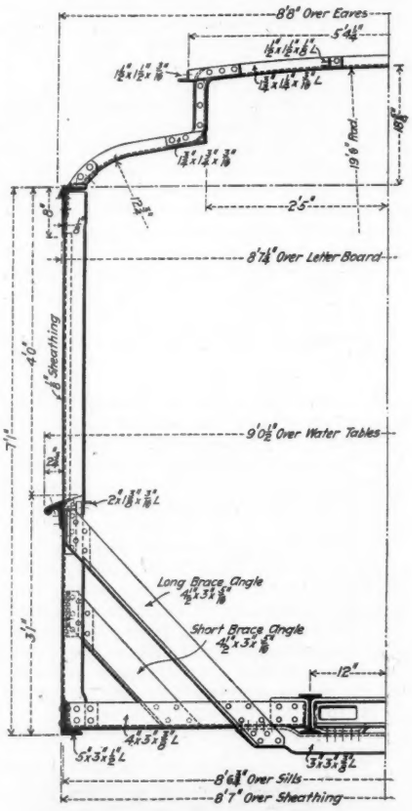
There is a peculiar and unexplained interruption in the working of automatic block signals. A train will find a given signal at stop while there is nothing in the block and all the relays are holding up properly, still there is no current to operate the signal or its controlling magnets. I have seen this condition a number of times at different points along the line during the progress of a thunder storm. The freak, if so it can be called, is perhaps partially explained by the fact that the galvanic current of an electrical circuit may be opposed and counteracted by the successive electrical movements attending lightning discharges. The air seems to be so completely saturated with electricity as to neutralize the currents delivered by the primary cells.

To convey the impression that thunder or lightning storms are only prevalent in the summer would be wrong. Every winter, either with or without snow on the ground, signals situated on some mountain ranges are visited by very heavy lightning storms. Quite often much damage is done to the apparatus. For three seasons in succession such storms have been observed to be more severe than any storms recorded at the same place during the summer. But there are only one or two storms in a winter, whereas probably a dozen occur during the summer months.

Steel Cars for the New York Subway.

About two years ago the engineers of the New York subway undertook to design a suitable car for use in the tunnels. The cars in use on the elevated lines having been found to be about as satisfactory a general design as could be found, they were taken as a basis for the new cars which were to be built. In a general way the conditions of traffic and congestion at stations were assumed to be the same in the subway as on the elevated lines. The clearances in the tunnel were very limited both as to height and width, and the sharp curves prevented the use of a car of exceptional length. There was, further, the added difficulty of designing a car which would be practically collision proof and fireproof, because, in the event of accidents either because of a collision or a fire due to short circuits the results would be far more serious than on the surface or elevated lines, as was shown by the disaster in the Metropolitan Underground of Paris.

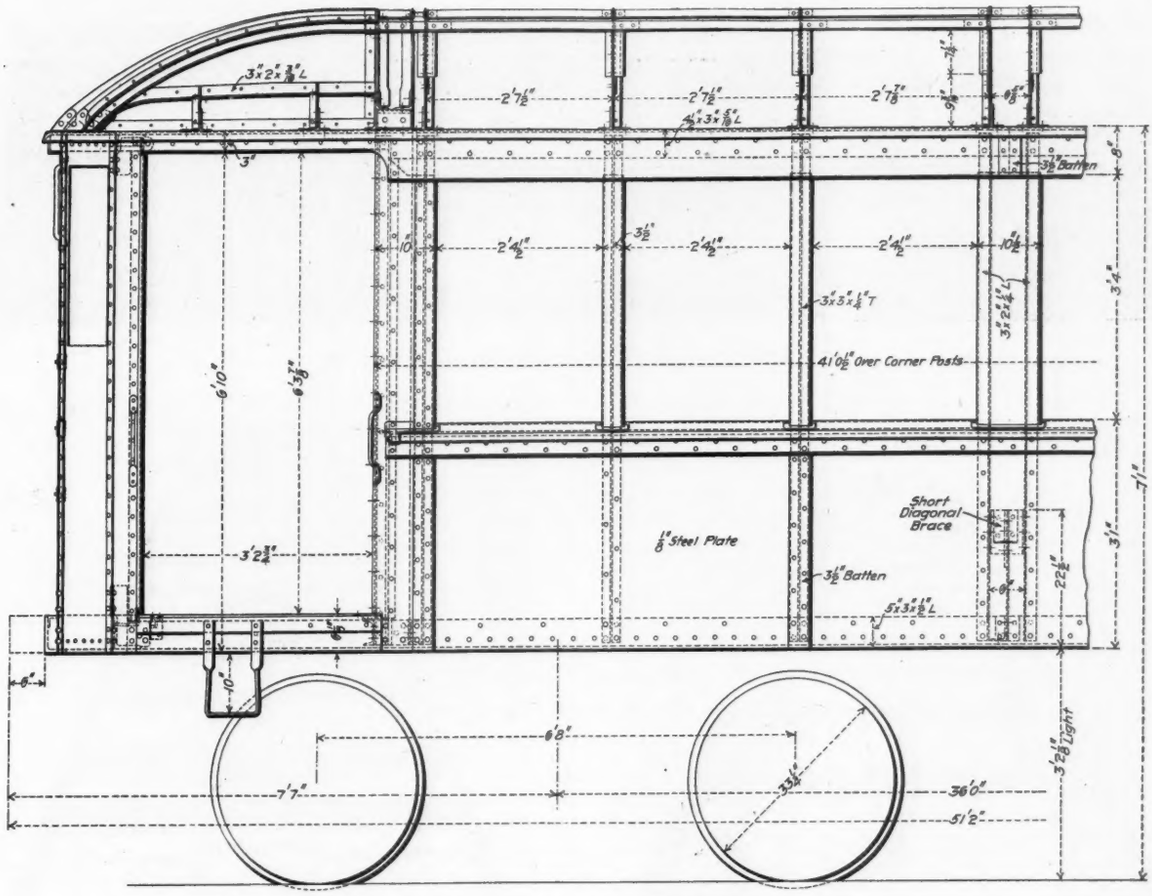
The first cars which were built for use in the subway had steel underframes and were much more substantial throughout than the standard elevated cars. The side sheathing was made of copper-sheathed timber with the view of making the cars practically fireproof from external flames. The chief difference between these cars and the cars built expressly for the elevated lines was that the subway cars had closed platforms with sliding entrance doors instead of platform gates, and



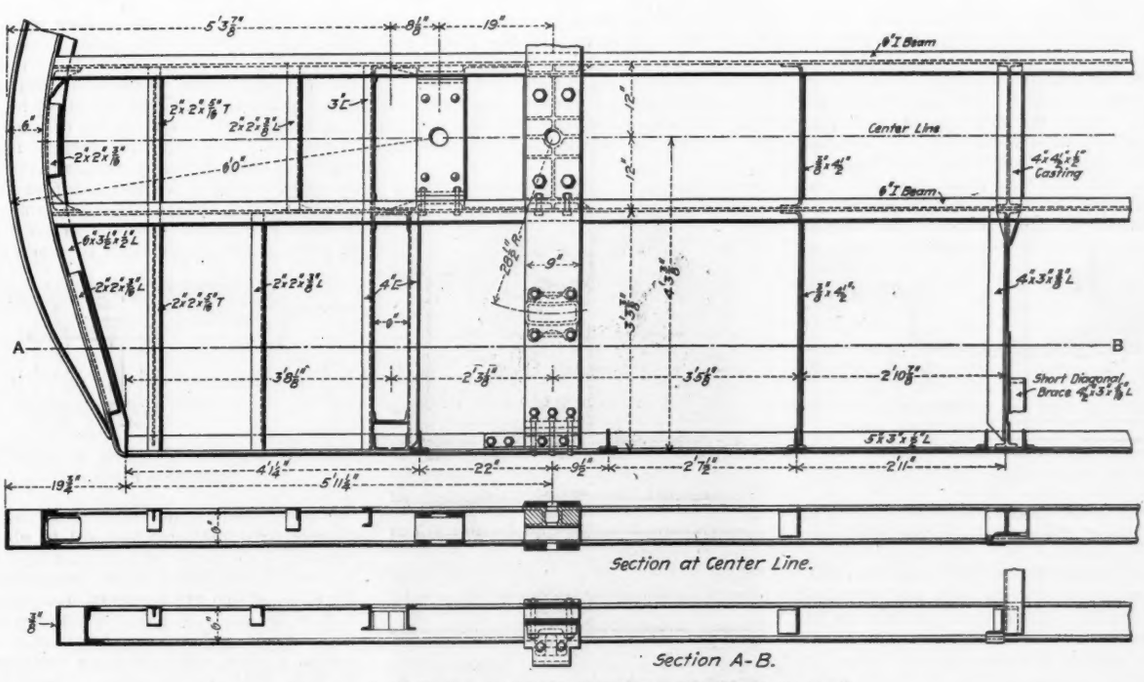
Half Cross-Section of Steel Car.

that they were built with a batter to the sides which gave about 8 in. additional width to the aisles without increasing the width at eaves. About 500 of these cars were built the order being divided between the Wason Manufacturing Company, the Jewett Car Company, the St. Louis Car Co. and the John Stephenson Company. Many of them have been used on the elevated lines pending the opening of the subway. These cars are practically fireproof so long as the wood does not get splintered and exposed by the removal of the copper sheathing. They would probably suffer little damage from a fire breaking out under the car due to short circuits in the motors, since the floor is protected with layers of asbestos and fireproof felt, but in the event of a collision and the consequent splintering of the woodwork which would take place they would probably be but little less fireproof than the ordinary design of wooden car.

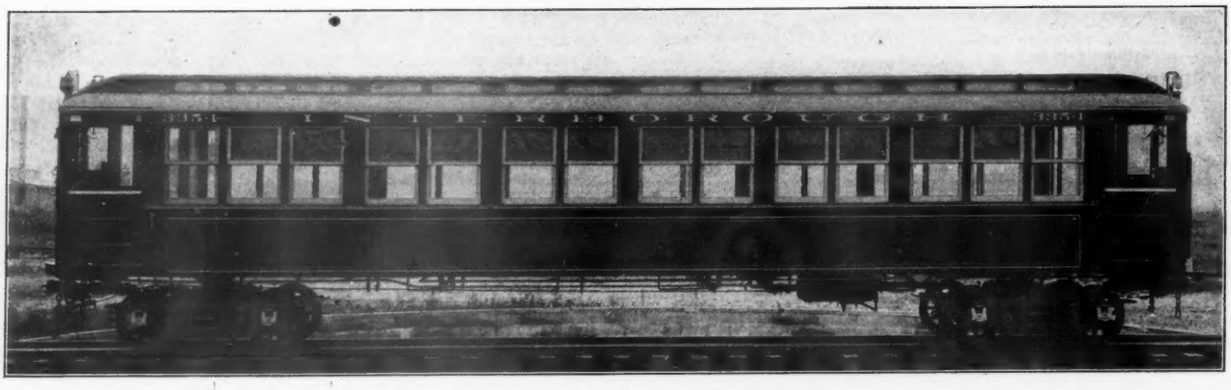
Mr. George Gibbs, the Consulting Engi-



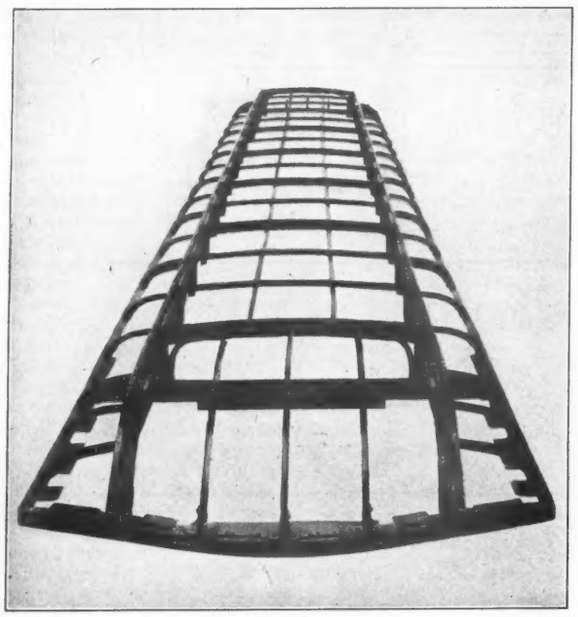
Part Side Elevation of Steel Car for the New York Subway.



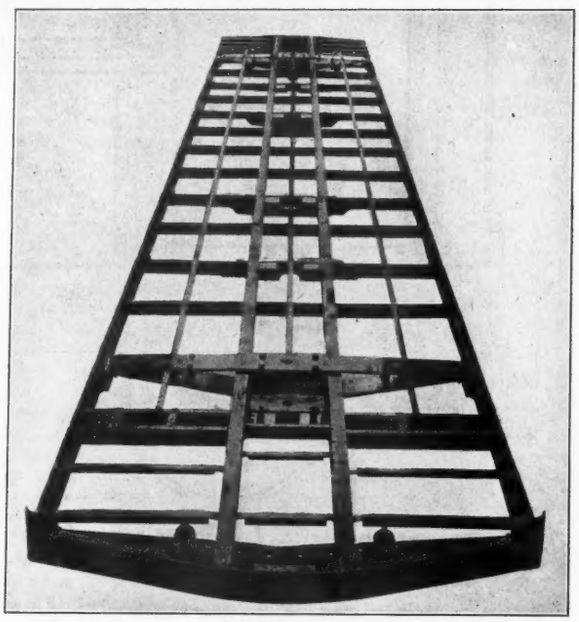
Plan and Sections of Steel Underframing for Subway Car.



Side Elevation of Steel Car for the New York Subway.

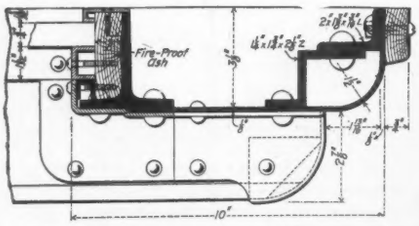


Roof Framing of Subway Car.



Underframing of Subway Car.

neer for the subway company, conceived the idea of departing from previous practice in car building in a radical manner, and some time ago undertook to design a car built almost entirely of steel and non-combustible material. After the first design had been completed, an experimental car was built at the shops of the Pennsylvania Railroad at Altoona, Pa., and was given a severe test to determine its riding qualities and its strength. In erecting this car a number of

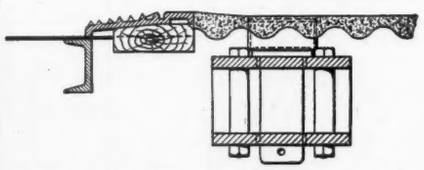


Section through Door and Corner Posts.

difficulties were encountered due to some of the details of the design. Before any large order was placed the plans were revised and a number of changes made in them which would lessen the cost and difficulty of manufacture. About eight months ago 200 of these cars were ordered from the American Car & Foundry Company to be built at its Berwick, Pa., plant, and an additional order for 100 cars was placed about two months ago with the same company. Most of the cars in the first order have been received and are now being run in the instruction trains in the subway and also in some of the regular trains on the elevated lines.

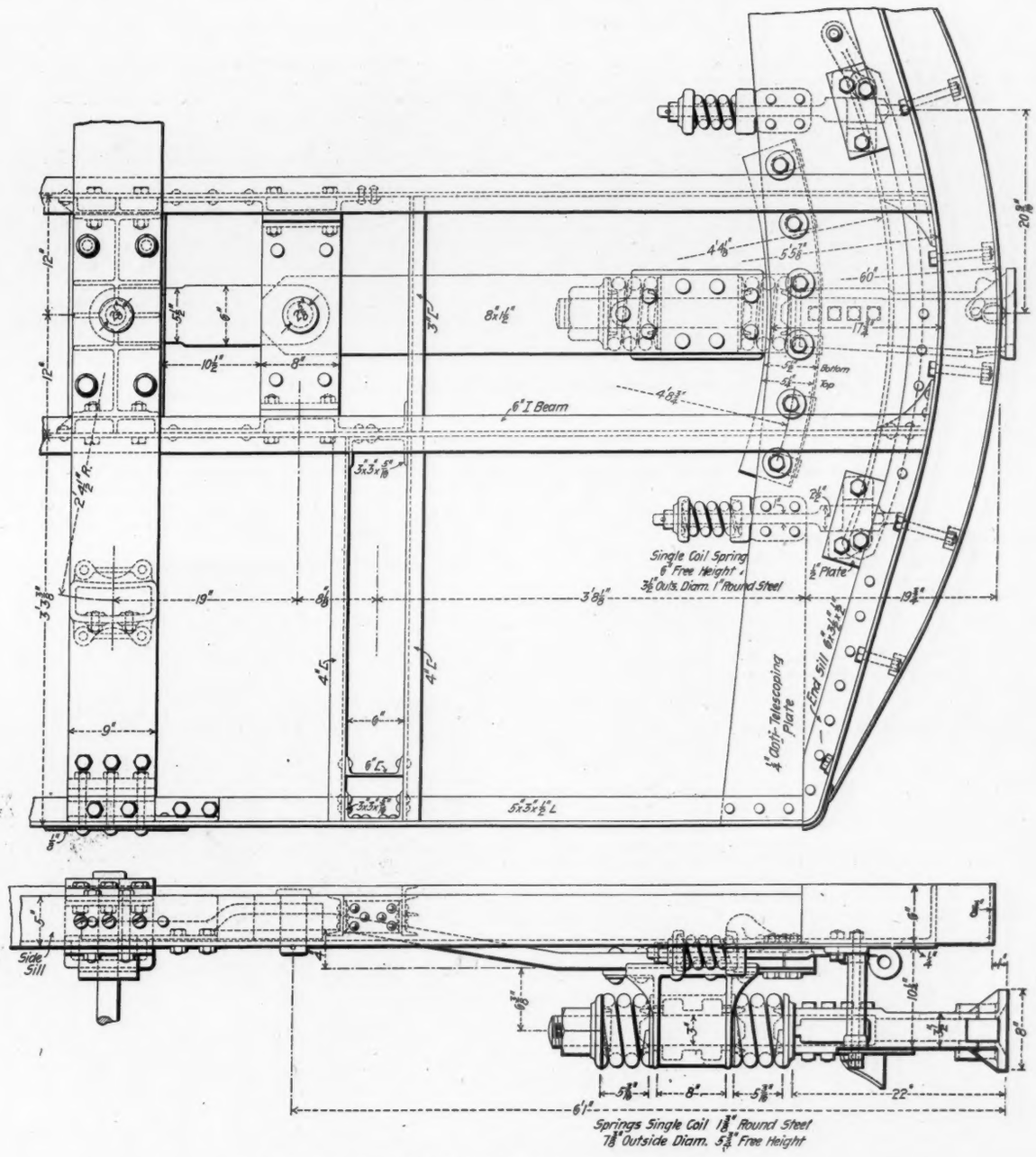
The accompanying illustrations show the general design of the cars and some of the most interesting details of their construction. They are 51 ft. 2 in. long over platform end sills and 36 ft. center to center of trucks. The width at eaves is 8 ft. 8 in., and the maximum width over the water tables under the windows is 9 ft. ½ in. The height from top of rail to top of roof is 11 ft. 11½ in. The sides are vertical and because of their thinness as compared with the side framing of the first design of wooden cars which had battered sides the same width of aisle is obtained, with no greater width at eaves. The underframe is composed of

End View of Car.



Detail Showing Method of Laying Monolith Floor.

two 6-in. I-beam center sills, which are continuous from platform end sill to platform end sill, and 5 in. x 3 in. x ½ in. angles forming the bottom flange of the deep plate girder sides, which are depended upon to carry most of the load. The center sills are spaced 24 in. apart and are separated by 4 in. x 4½ in. x ½ in. castings of an I-section and by ⅜ in. x 4½ in. tie straps. The body bolsters are made up of two flat plates 9 in. x 1 in., which are carried over and under the



Plan and Side Elevation of Van Dorn Draft Gear for Subway Cars.

center sills, with a cast steel filling block in between, which forms the socket for the king pin. The body end sills are made up of a pair of 4 in. channels, built in between the longitudinal sills. They are entirely separate members and are not an integral part of the underframing. The platform end sills are 6 in. x 3½ in. x ½ in. angles bent to a radius of 5 ft. 6 in.

The side framing of the car, which carries most of the load, is made up of the 5 in. angle at the bottom and a special bulb angle running the length of the car body just under the windows, with a ⅛-in. steel plate side sheathing to form the web of the girder. The girder thus formed is stiffened vertically by the 3 in. x 3 in. x ¼ in. T-iron posts, which extend from the bottom of the sides up to the deck. These are spaced 2 ft. 7½ in. center to center. The side frame is braced to the underframe with the diagonal braces shown in the cross section. These braces are placed at each of the double posts and carry the floor load to the side girders, thus permitting a light floor construction. The short brace, which is a 4½ in. x 3 in. x $^{5}/_{16}$ in. angle, extends from about half way up on the plate girder side down to the intermediate cross tie of the underframe. The long brace extends from just under the window down to the main cross bearers near the center sills, and is concealed inside the car by the back of the cross seats. There are two short braces and two long braces on each side of the car.

The roof framing is made up entirely of light angles bent to fit the curve of the deck. The shape of the deck is rather shallow, and this gives the cars the appearance of having considerable head room.

The platform of the steel cars, which is of the Gibbs type, is longer than that on the wooden cars which were built and the entrance doors have been made 10 in. wider, which greatly facilitates the movement of passengers in and out of the car. The platform is entirely enclosed and has a window in each side in addition to the glass in the doors. An end door is cut through the middle of the end of the platform to permit passengers or trainmen to walk through the train. The motor controlling apparatus and engineer's brake valve and a vertical hand brake wheel are mounted against the end of the platform.

One of the illustrations shows a section through the end door posts. It will be seen that some small amount of wood has necessarily been used here to finish off the post. Such wood as has been used is ash, impregnated with a fireproofing compound which renders it practically incombustible. When exposed to flame it will char but will not ignite. Some little wood has been used in the interior finish around the windows and in the lower part of the deck, but this has also been fireproofed, and all of the wood in the car taken together represents only a small proportion of the total amount of material used.

The floor of the car is made of a composition known as monolith, about 1½ in. thick,

laid on corrugated iron which rests directly on the underframe. The seats are arranged as in the cars used on the elevated roads, with four pairs of transverse seats in the center and longitudinal seats along each side for the remainder of the length of the car, giving a seating capacity for 52 persons with standing room in the aisles and on the platform for as many more. The seats are upholstered with rattan, but the framing which supports them is entirely of steel. All of the interior trimmings, panels and head linings are aluminum throughout. The exterior surface of the car has a smooth appearance, and is painted the standard maroon of the Interborough Rapid Transit Company. For a complete description of the trucks under these cars the reader is referred to the *Railroad Gazette* for June 17, 1904, and for a description of the motors and electrical equipment to the *Railroad Gazette* for April 3, 1903. We are indebted to Mr. George Gibbs, Consulting Engineer of the Interborough Rapid Transit Company, for the illustrations furnished.

Railroad and Industrial Courses at Wharton School.

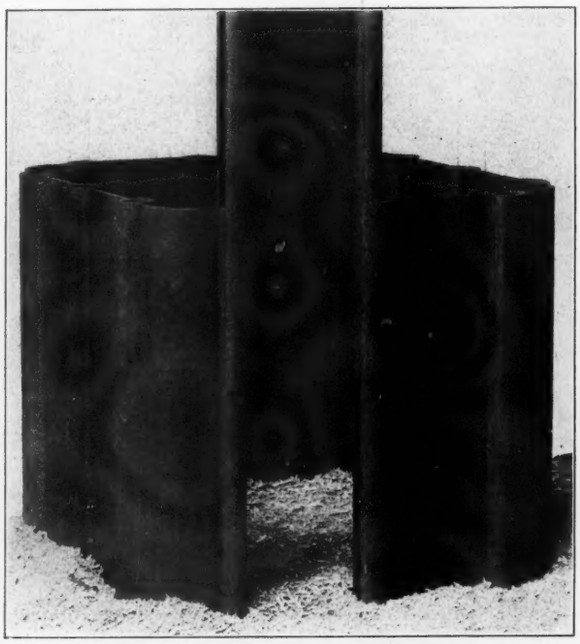
Mr. Joseph Wharton, the founder of the Wharton School of Finance and Commerce, of the University of Pennsylvania, has recently raised the endowment of the school to $500,000 and the school has been reorganized. A large number of specialized business courses are to be offered at the opening of the college year on September 30th, with a view to fitting young men directly for their prospective business careers. In the first two years the work includes besides Economics and the usual Commercial studies, Industrial Processes and Field Work in Industry, also English Literature, Languages, etc. In the third year there are now open courses in Industrial Management which deal with the methods of collection and marketing of raw material, manufacturing and merchandising; Insurance; Railway Transportation, including the practice and principles of rate-making, of the physical and financial characteristics of the leading railroads of the United States, of foreign practice and of the legal and business relations between shipper and carrier; Auditing, and Corporation Finance; a study of the methods of promoting, capitalizing and administering business corporations, and Public Finance; a study of taxation and of the activities of public bodies in borrowing and financial administration.

In Transportation, following the general course in the Junior Year, and also founded upon the preliminary work in commerce, the student is offered courses in railroad Organization and Operation, in Rates and Traffic and in Accounting. During the Senior Year courses are offered in Industrial Management, including manufacturing costs and depreciation, labor management; factory location and equipment, factory organization, advertising and sales. In connection with the industrial courses and Transportation, many business institutions are visited and their methods are studied. A large number of business men are called on to assist in the work of instruction by means of special lectures in their respective fields.

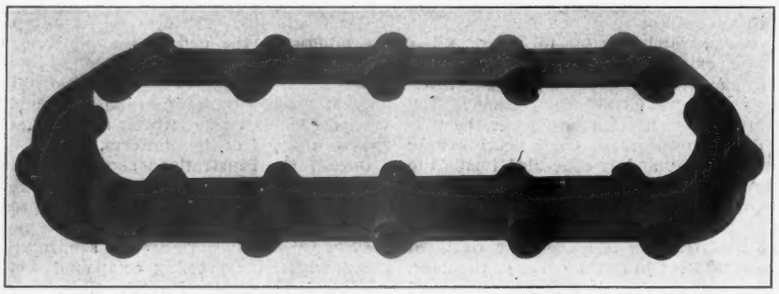
A New Metal Sheet Piling.

A new form of steel interlocking sheet piling is shown in the accompanying illustrations. Each pile is a single rolled piece of peculiar section, complete in itself and so shaped that a packing groove is formed between the contiguous edges. Ordinarily the piles are made 12 in. wide on centers and in lengths to meet requirements. They are formed from a special I-section, and several passes through special rolls give them the desired form. The packing groove is intended to be filled with dirt, mud, clay, concrete, cellulose or other suitable material at hand, although the material through which the piling is driven will in most cases fill the groove and form a tight and satisfactory joint.

The illustrations give some idea of the perfect alinement that can be obtained as well as the flexibility of arrangement of which the design is susceptible. It is possible to form a complete circle of small diameter without difficulty. Corners and other changes of direction are easily provided for, while for junctions a special form of pile is, of course, needed, having an additional edge at right angles to the web of the pile. The piling is simple in design and cheap to make. It is made and sold by the United States Steel Piling Company, 135 Adams street, Chicago.



Rectangular Enclosure Formed by Steel Sheet Piling.



Steel Sheet Piling Rolled from I-Beam Sections.

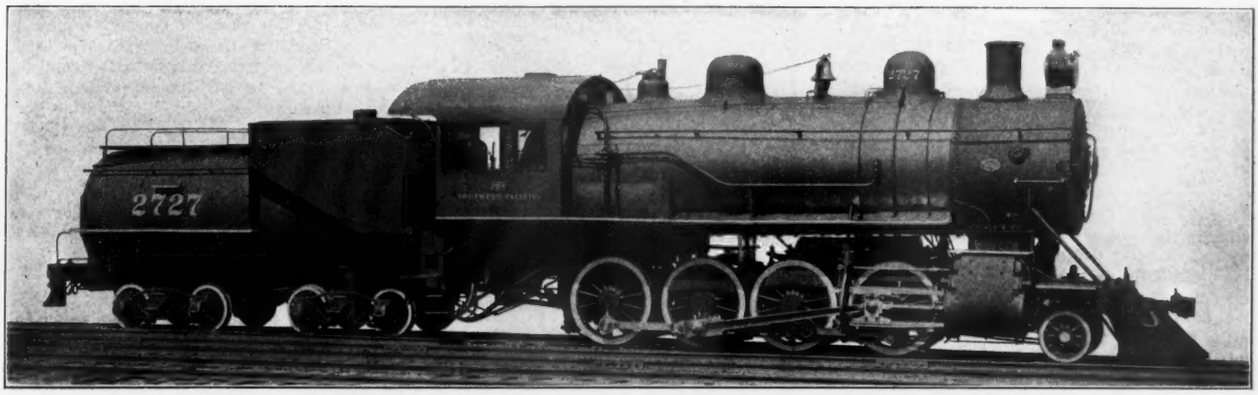
Sections of Steel Sheet Piling.

New Locomotives for the Southern Pacific.

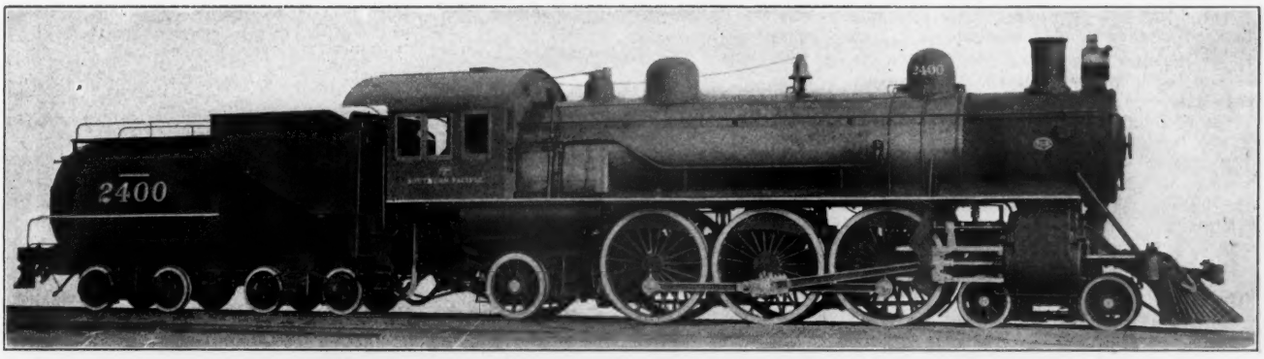
The accompanying illustrations show four new locomotives recently built for the Southern Pacific by the Schenectady Works of the American Locomotive Company. All of these engines use oil as fuel except the Pacific type (4-6-2). As is well known, the Southern Pacific has been experimenting with fuel oil for several years and hence the present order may be taken to mean that the use of oil has been satisfactory. The proximity of the Southern Pacific lines to the Texas and California oil fields makes possible the economical use of oil especially since the cost of coal in that region is pretty high. The extension of the use of oil to switching engines should also prove economical as the intermittent service of switching engines is wasteful of coal. With oil, the intensity of the fire can be varied so that the amount of fuel used is proportional to the power used.

The consolidation (2-8-0) type locomotive weighs 203,500 lbs. in working order, with 181,000 lbs. on the drivers. The weight of the engine and tender in working order is 338,600 lbs. The cylinders are 22 in. x 30 in., and the drivers are 57 in. in diameter. Assuming that 85 per cent. of the working pressure of 200 lbs. is available as mean effective pressure at starting, this gives a maximum tractive effort of about 43,300 lbs. The boiler contains 413 2 in. tubes 15 ft. long. The total heating surface is 3,410.3 sq. ft., with 184.6 sq. ft. in the fire-box. The grate area is 49.5 sq. ft. The tender carries 7,000 gallons of water and 2,940 gallons of oil.

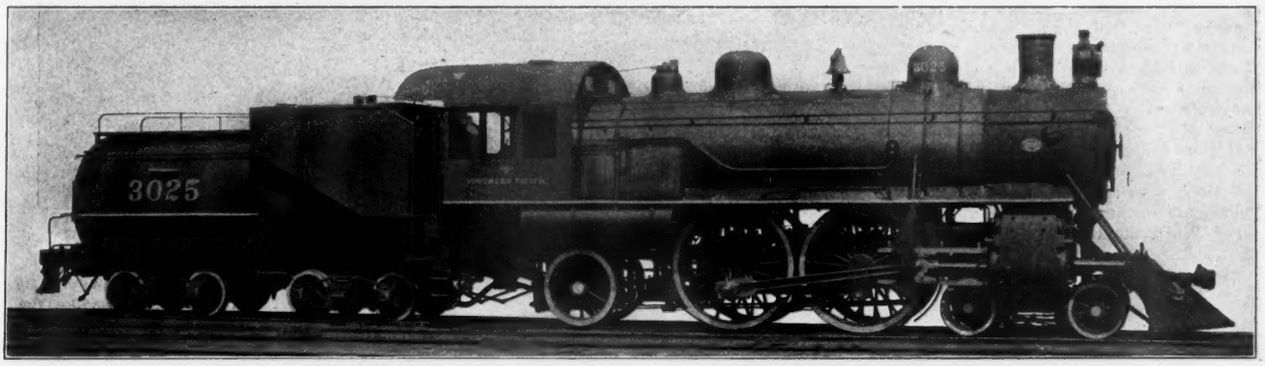
The Pacific (4-6-2) type locomotive weighs 214,000 lbs. in working order with 133,000 lbs. on the drivers. The weight of the engine and tender in working order is 347,600 lbs. The cylinders are 22 in. x 28 in. and the drivers are 77 in. in diameter. Assuming that 85 per cent. of the boiler pressure of 200 lbs. is available as mean effective pressure at starting gives a maximum tractive effort



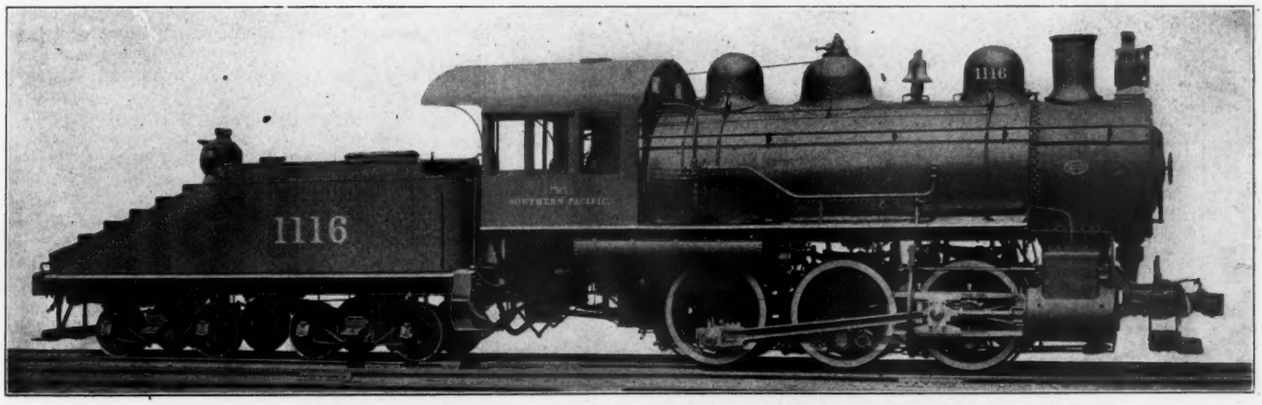
Oil Burning Consolidation (2-8-0) Locomotive—Southern Pacific.



Coal Burning Pacific (4-6-2) Type Locomotive—Southern Pacific.



Oil Burning Atlantic (4-4-2) Type Locomotive—Southern Pacific.



Oil Burning Six-Wheel (0-6-0) Switching Engine—Southern Pacific.

of about 29,900 lbs. The boiler contains 245 2¼ in. tubes 20 ft. long. The total heating surface is 3,054 sq. ft. with 179.7 sq. ft. in the fire-box. The grate area is 49.5 sq. ft. The tender carries 7,000 gallons of water and 14 tons of coal.

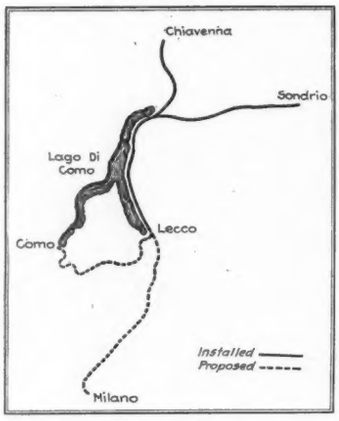
The Atlantic (4-4-2) type locomotive weighs 186,500 lbs. in working order with 97,500 lbs. on the drivers. The weight of engine and tender in working order is 321.-620 lbs. The cylinders are 20 in. x 28 in. and the drivers are 81 in. in diameter. Assuming that 85 per cent. of the boiler pressure of 200 lbs. is available as mean effective pressure at starting, gives a maximum tractive effort of about 23,500 lbs. The boiler contains 297 2 in. tubes 16 ft. long. The total heating surface is 2,654.4 sq. ft. with 179.2 sq. ft. in the fire-box. The grate area is 49.5 sq. ft. The tender carries 7,000 gallons of water and 2,940 gallons of oil.

The six-wheel switching engine (0-6-0 type) weighs 147,000 lbs. in working order. The total weight of engine and tender in working order is 227,060 lbs. The cylinders are 20 in. x 26 in. and the drivers are 57 in. in diameter. Assuming that 85 per cent. of the boiler pressure of 180 lbs. is available as mean effective pressure at starting, gives a maximum tractive effort of about 27,900 lbs. The boiler contains 276—2 in. tubes 11 ft. 6 in. long. The total heating surface is 1,806 sq. ft. with 156.1 sq. ft. in the fire-box. The grate area is 30.2 sq. ft. The tender carries 4,000 gallons of water and 1,020 gallons of oil.

The Ganz Three-Phase Electric Railway System.

BY G. LEVE.

The Valtellina line, a part of the Adriatic System of the Italian Government railroads, has for more than two years been operated by the three-phase alternating current system installed by Ganz & Company, Budapest, Austria-Hungary. The results, so far, have been satisfactory and enough data has been collected to show conclusively the economic advantages of the system. In the preliminary studies to design a suitable electric traction for main line railway traffic such as required for the Valtellina Line, the use of direct current motors and also the single phase alternating current motors were considered. While the direct current has some ideal characteristics for transportation work, nevertheless the low voltage usually employed and the resulting limited distance within which it can be directly transmitted makes it uneconomical for moving heavy main line traffic. Furthermore, the capital outlay for current conductors, sub-stations, etc., is so great, that its use remains limited to special cases covering terminal facilities in large cities or to a few suburban branch lines of existing railroads.

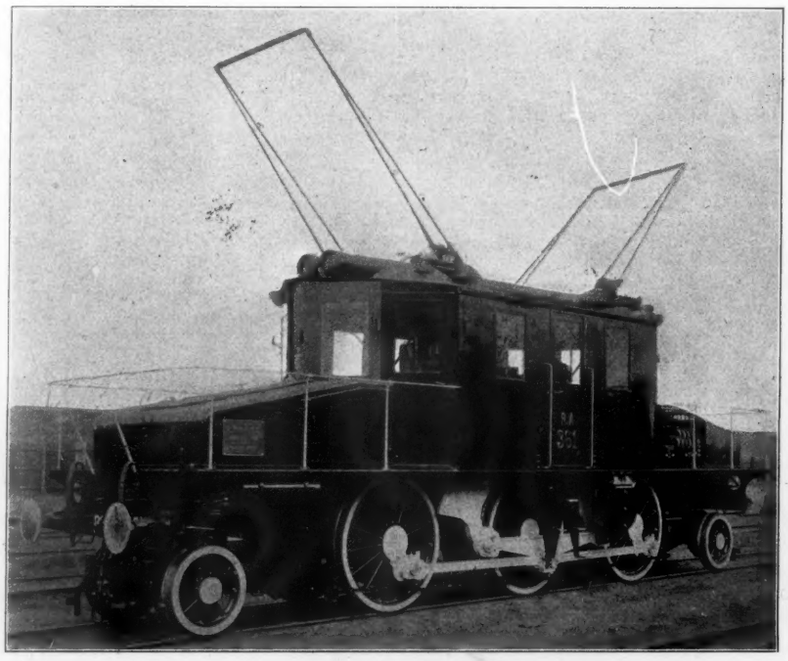


The Valtellina Line.

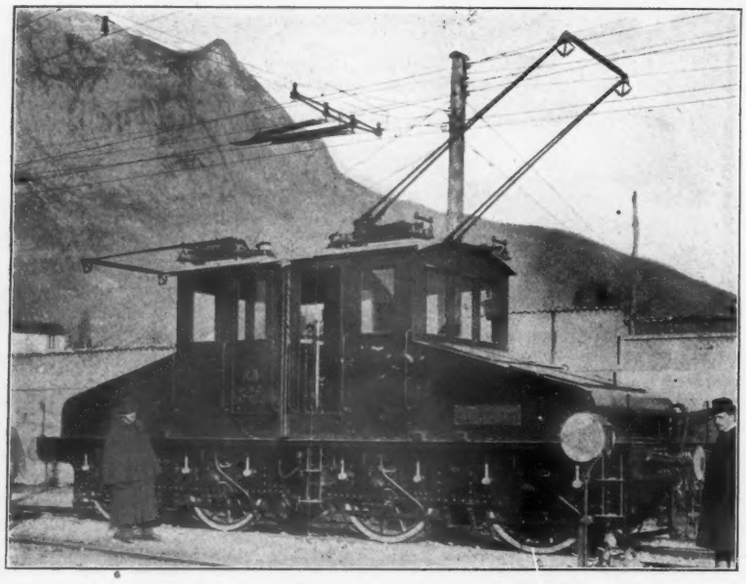
About eight years ago Ganz & Company began to design an alternating current traction system which should have the following characteristics:

(1) Ability of moving main line traffic in such units and at such intervals as is now being moved with steam locomotives, with promptness, security, safety and comfort.

(2) The capital outlay for such equipment should not be prohibitive from a commercial viewpoint.



Latest Type of Three-Phase Locomotive—Valtellina Line.



First Type of Three-Phase Locomotive—Valtellina Line.

(3) By its use the saving in operating cost, as compared with steam locomotives, should be such as to allow the capital outlay to be written off within 15 years, notwithstanding an ample allowance being made for cost of maintenance.

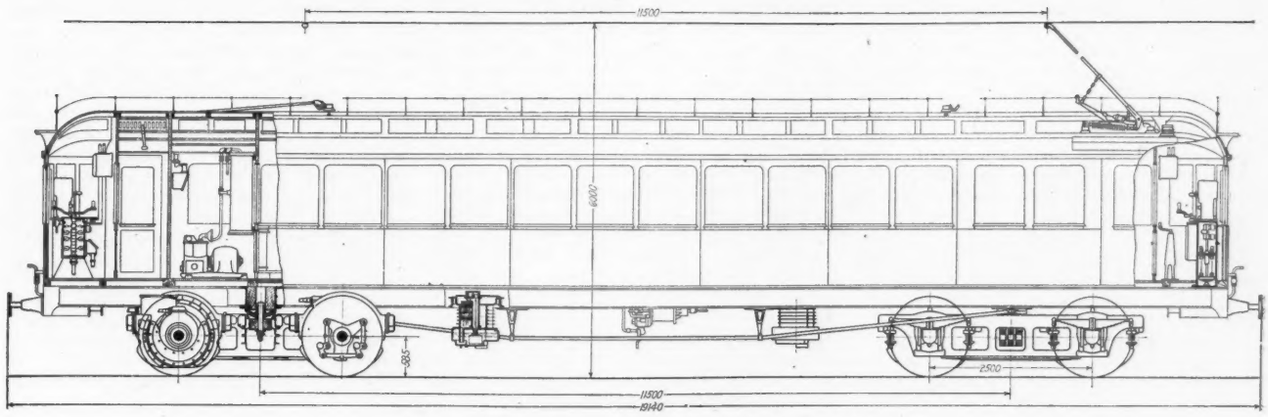
Alternating current permitted two systems to be used—the single-phase and the three-phase. The advantages and disadvantages were very carefully considered by the engineers of Ganz & Company before arriving at a decision in favor of the three-phase system. For more than 15 years Ganz & Company have been engaged in the manufacture of "compensated" single-phase series commutator motors for power transmission, and were therefore thoroughly versed as to its characteristics nevertheless they preferred the three-phase motor for traction work.

Advantages of the single-phase motor for traction purposes are as follows:

(a) Only one current conductor is required.

(b) Voltage control, or resistance control, using a similar controller to that of the d. c. motor, for speed regulating.

(c) Its ability to be used also with direct current, so that a car equipped for service on a single-phase alternating current line can



The Ganz Three-Phase Motor Car—Valtellina Line.

also pass to a line equipped with direct current.

Its disadvantages are:

(a) The use of a commutator which is claimed to be not desirable for heavy railroad work owing to the increase in the cost of maintenance and the risk of interruption of service inasmuch as for heavy railroad work abnormally large quantities of current must be handled.

(b) Owing to the pulsation characteristic of single-phase alternating current, the torque is pulsating and a maximum torque which will slip the wheels results in an average drawbar pull of but 50 per cent. of that of the direct current or three-phase motor at starting and thus requires an increase in weight to obtain an equivalent performance of 80 to 100 per cent. and consequent increased capital outlay.

(c) While but one current conductor is needed, it has to be of so large size to convey the quantity of power required that it allows no saving in the weight of copper when compared with the two wires of the three-phase system.

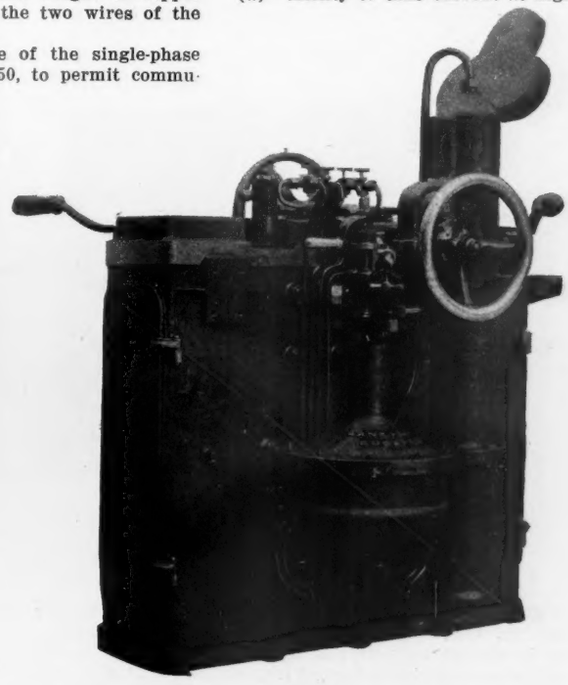
(d) As the voltage of the single-phase motor is limited to 250, to permit commutation a step-down transformer is needed on each car or locomotive for lowering the voltage of the current received from the contact wire, without any corresponding gain in economy or reduction in motor weight such as would result in a three-phase system.

The advantages and disadvantages of the three-phase motor can be summed up as follows:

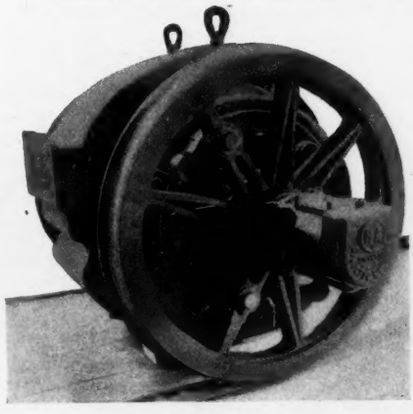
(a) Ability to take current at high volt-

Three-Phase Twin Motor of Latest Type Electric Locomotive.

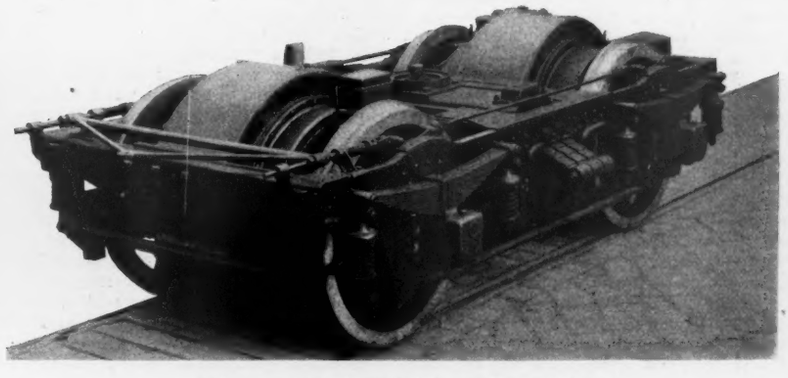
(Both high and low-tension motor on one shaft and under one housing, both taking current from one set of contact rings.)



Pneumatic Control Apparatus for the Three-Phase Locomotive.



Three-Phase Motor Connected by Links to Driving Wheel.



Motor Car Truck with Three-Phase Motors.

age (Messrs. Ganz & Co. decided that 3,000 volts was a satisfactory value). This is taken direct from the contact wires into the motor, which, owing to its polyphase construction, requires no high tension moving contacts and absolute safety can therefore be attained.

(b) It has not a pulsating torque and therefore will render, at about half the locomotive weight required for single-phase, the necessary drawbar pull, giving the same high tractive coefficient as the d. c. motor.

(c) The delicate commutator is eliminated and replaced by heavy contact rings easily accessible and not subject to sparking.

(d) Electric braking. That is, the capability of employing the kinetic energy of the train to generate electric current and to return it to the line. This is due to properties peculiar to multiphase motors and has been fully demonstrated on the Valtellina line and other European lines employing three-phase traction. This special characteristic of the three-phase motor is an advantage as to economy of energy required, not possessed by other electric systems, or steam traction. Furthermore, the necessity of mechanical braking is greatly reduced and hence the wear of the brake equipment wheel tires and rails is reduced to a minimum.

(e) The ability of running three-phase equipment on a line equipped with direct current.

The disadvantages of three-phase traction advanced by its opponents are:

(a) The extra contact wire required, but as already stated the weight of copper is thereby not increased, so that the principal increase of investment is simply the cost of suspending an additional wire.

(b) The use of a low tension motor in addition to the main motor. The former is used for starting and for slow speed running, and usually runs empty when running at full speed. This extra weight of the low tension motor of the three-phase equipment, as also that of the liquid rheostat, is more than offset by the transformer weight and increased weight of the motor of the single-phase system, and is moreover not an inherent necessity of the system.

(c) The fixed speed control which limits the operation to a limited number of predeterminate speeds. Instead of being a disadvantage this is claimed by Ganz & Company to be rather an advantage, as trains irrespective of weight and grade can adhere to uniform speed.

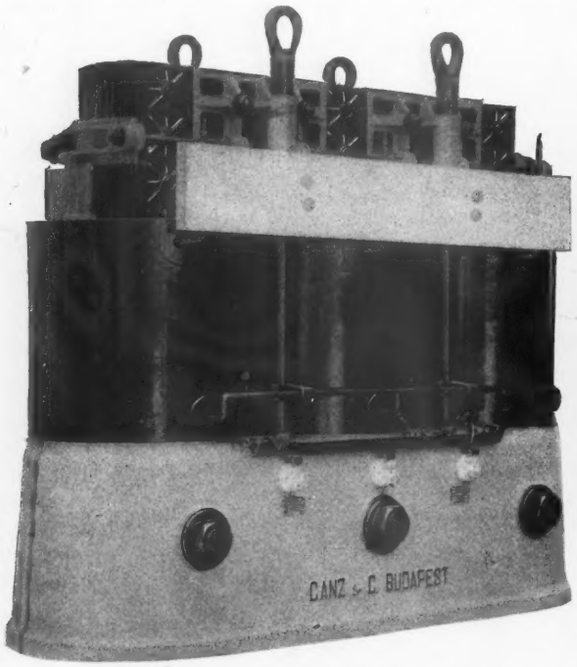
During 1898 and 1899 Ganz & Company operated a specially installed test line about four miles long on an island in the Danube near Budapest. The results there obtained warranted their accepting a contract for the installation of the Valtellina line. The contract was very stringent and provided that in case the installation should not prove satisfactory during the first two years' operation, the contractors should remove the overhead equipment, transformer stations and electric rolling stock and should only be paid for the value of the central station and high tension transmission line. The entire installation, 106 kilometers, or about 65 miles, extending from Lecco to the northern terminals, was completed early in 1902. The Government having, by a practical service of one year and a half, found that all the severe conditions had been more than fulfilled, ordered the settlement to be made for the entire installation several months ahead of time and entered into active negotiations for extending the electric service from Lecco southward to Milan. Roughly, about 60 per cent. of the entire length is composed of gradients up to 2 per cent. tunnels, rock galleries and sharp curves. From Lecco the line follows the shore of Lake Como to Collico, from which point the main line continues eastward to Sondrio and a branch line runs northward from Collico to Chiavenna.

The central station is located at Morbegno, a station on the main line between Collico and Sondrio, and has three turbine generator sets each of 2,000 brake horse-power. Only two of them are kept in regular service, one acting as reserve. The three-phase current is generated at 20,000 volts with a periodicity of 15. The high tension conductors run from Morbegno to Sondrio to the east and to Collico to the west and Lecco to the south; also from Collico along the branch line to Chiavenna. Constant improvements have been made and in the installation of a new line many new features would be used which are not embodied in the Valtellina construction. The Valtellina overhead construction, however, has shown itself in every way to be satisfactory, as will be seen by the low cost of maintenance hereinafter mentioned.

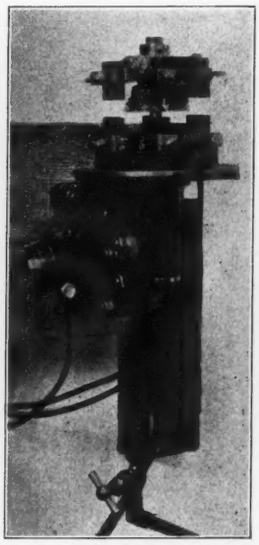
The three high tension wires can be suspended from the same posts as the cross hangers carrying the working conductors, except where tunnels are encountered, in which case the high tension line is generally carried on separate posts over the mountains instead of through the tunnel. The entire line is divided into sections of about six miles each. Each section has a transformer station, where the high tension (20,000 volt) current is reduced to 3,000 volts, at which tension it flows through the working conductor and is at that pressure taken off by the trolley of the locomotive and motor cars.

The location of these transformer stations has been selected with a view to having them either near the regular road section houses or near the railroad stations so that the regular service of inspecting the line equipment and the transformer sub-stations can be attended to by the regular road section gang, supplemented by an electrician and several laborers. The transformer is of the air-cooled core type. As all these transformer stations are connected to the working conductors the system gives great elasticity of capacity, enabling any one section to take care of any exceptional load which may suddenly be thrown upon it through an accidental interruption of service on any of the other sections. As all the regular railroad stations, freight stations and repair shops have to be supplied with low tension current for light and power transmission, transformers are located at such stations so as to furnish current for this purpose.

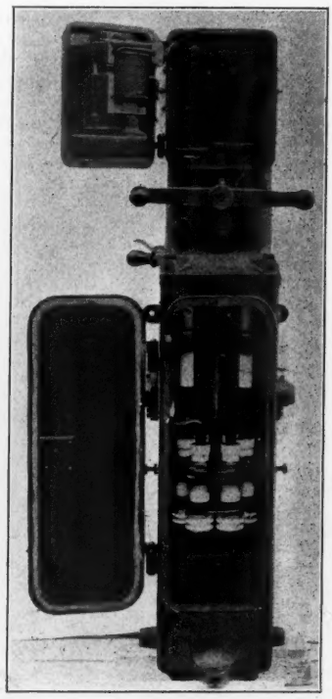
Up to the present the passenger trains have been hauled by motor cars of the type shown. They are equipped with two high tension and two low tension motors, the stators of which are suspended from the



The Ganz Three-Phase Transformer.



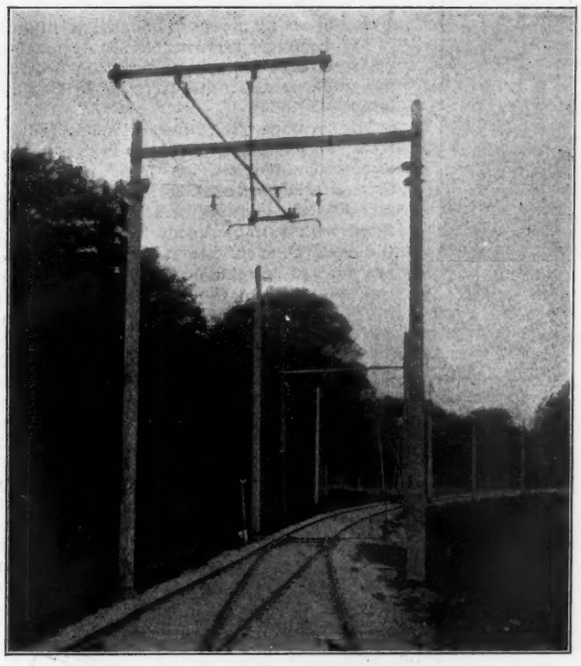
Automatic Switch Governor for the Air Compressor.



Primary Cut-Out Switch—Ganz Motor Car.

truck frame and the motors are fitted on a hollow shaft which slips over the wheel axle and connected by links to the spokes of the wheel. Thus the entire motor is spring borne. Much has been said about the small air gap of the three-phase motor, but three years' experience has proven that it causes no trouble whatsoever. During all that time the wear on bearings is hardly perceptible. The other electric equipment of the car consists of the pneumatic and electric controlling apparatus as well as an electrically operated air compressor, furnishing the compressed air for the controlling apparatus and for the air-brake. A small step-down transformer furnishes the low tension current for this air compressor as also for the lamps. Starting and regulating of speed is obtained by means of the liquid rheostat, and so smoothly that the start is hardly perceptible to those riding on the car.

The first operation, in starting out, is the raising of the trolley to establish contact with the working conductors, which is done by means of compressed air. When the contact is thus established, access to the high tension switch and leads, which are completely covered in an iron casing, is impossible, as the lid is closed by an interlocking device and can only be opened when the trolley is lowered and the switch and leads are currentless. Any possible defects in the insulation of any parts carrying the high tension current are made harmless because the iron casing connects with the wheels and thereby establishes a ground for escaping current. In starting, the high tension current passes to the stator of the main motor. The rotor of the main motor feeds the low tension stator by cascade connection. The rotor of the low tension motor is in circuit with the liquid rheostat. Thus the low tension motor carries the load with the high tension motor until half speed is reached, after which the low tension motor is cut out and the rheostat is put in circuit with the high tension motor until full speed is attained.



Overhead Construction of Test Line on Island in the Danube.

The Ganz trolley consists of two poles with double roller contacts. It requires two separate bases and poles, as would be the case were there two single trolleys. The outer ends of the two poles are connected by a continuous bar of impregnated wood, the central portion of which for a distance of about eight inches is the full diameter of the rolling contacts. On each side the diameter is reduced and two contact cylinders are slipped over and supported on insulated ball bearings, the current being taken off by carbon contact rings at the ends and is carried by flexible jumpers to the trolley poles. The cross bar with its contact rollers is flexible and is connected to the ends of the arms by

Insulated Trolley-Wire Hanger—Valtellina Line.

horizontal spiral springs, permitting contact when the two wires are at widely different heights. The rollers are steel copper plated and will run over 6,000 miles before replating becomes necessary. The trolley poles are supported by spiral springs in tension, the tension being put on from within the vehicle by compressed air. This trolley cannot run off the wire as is the case with the wheel trolley, and this accounts for the fact that the overhead construction of the Valtellina line required hardly any repairs during the two years of regular service.

There are ten motor cars, the interior of two of which are arranged as parlor cars. Two of these motor cars are generally in reserve and under inspection, and eight are constantly in service. The average passenger train weight is 130 metric tons and the average speed 35 miles per hour. The horse power per car is 300. For freight service two locomotives were used, the electric equipment of which corresponds to the motor cars. Recently, three new locomotives of 62 tons (metric) weight and 1,600 horsepower, were delivered. The motors of these new locomotives are suspended between the driving axles. There are two sets of high and low tension motors. Each set works as twin motors on one axle and is supplied with current from one set of contact rings. The twin motor shaft works a crank, which, in turn, is connected to sidebar drives connecting the three sets of driving wheels.

At the official test several round trip runs were made between Lecco and Collico with a trainload of 330 metric tons at a speed of 40 miles per hour even on a 1 per cent. grade. Furthermore, 20 consecutive accelerations with a train of 430 metric tons from standstill to 18.6 miles per hour were made. The entire locomotive equipment worked well, even when taking 240 amperes from the conductor. The Ganz overhead construction in the yard of Lecco has been successfully used, and demonstrates that the two wire overhead equipment has been successfully adapted for use at switches, cross-overs and side-tracks such as are necessary at terminal yards of main line railroads. Another important fact is that the installing of the overhead equipment and even its existence does not interfere in the least with steam locomotive traffic.

Another great advantage of electric traction is the protection it affords against collisions. If a motorman should disobey orders for meeting another train, or disregard the signal protecting the section he is about to enter, it is in the power of the station agent to throw the current off the line, thereby stopping all trains on this particular section, thus avoiding serious accidents.

As this three-phase traction system has now been in practical operation for over two years on a main line, it is possible to give nearly accurate figures as to the cost of installation as well as operating expenses. Assuming the length of line to be 100 miles and having an ordinary passenger and freight traffic amounting to 800,000 ton miles per day, the capital outlay for line equipment of substantial construction, including the necessary electric locomotives, would not exceed $10,000 per mile.

Careful tests show that the electrical energy consumption per ton mile would average on ordinary main line railroad work (where the daily passenger and freight traffic per 100 miles length of road would not be less than 800,000 ton miles, and that this tonnage would be about equally divided between freight and passenger trains) not to exceed 30 watt hours. This would show that basing a calculation on average typical loads of trains for both passenger and freight service (about 500 tons), that the amount of energy required would be 1,500 k.w.h. for a 100 miles haul.

With most modern equipment (based on cost of coal at $2.50) current can be generated by steam at $50 per k.w. per annum. (This cost could be decreased by using a gas plant and could be brought still lower if water power can be employed.) Therefore:

Cost of a 100 mile haul of a 500 ton train, or 50,000 ton miles	$8.50
(The $50 per k.w. includes the writing off and maintenance of the central station equipment.)	
Cost of maintenance and writing off of electric equipment (other than the central station) as shown by two years practical experience, with suitable additions to meet American conditions, based on a performance of 800,000 ton miles per day, length of line 100 miles, $330 for supervision and maintenance + $400 for writing off capital outlay per mile per annum brings this item of cost for 50,000 ton miles	12.50
Motormen and helper (on basis of 200 miles per day) for 100 miles	3.00
Total	$24.00

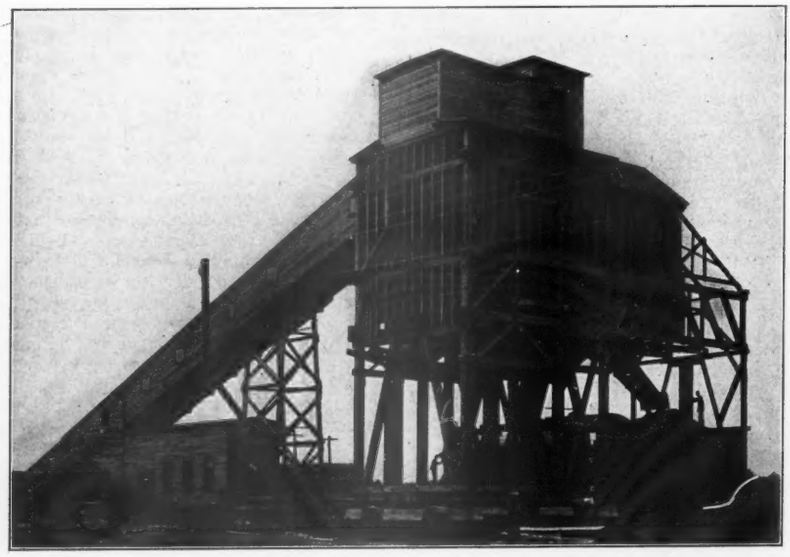
The reports of three prominent American railroads show that the cost of steam locomotive service per 100 miles, without considering the writing off of capital, amounts to about $26. It should, however, be borne in mind that an increase of the ton mileage above 800,000 per day for 100 miles of road would but slightly increase the item of maintenance of equipment, etc., and an increased traffic would therefore show still more favorable for electric traction. Beyond this point electricity will greatly reduce other items in cost of transportation not connected with train hauling, such as train station and signal lighting, as also power for moving turn and transfer tables; also, for loading

and unloading heavy freight. There would also be the saving in repairs on brake equipment, tires, etc., of rolling stock, and the cost of maintenance of substructure would also be reduced, as the balanced rotary motion of the electric motor would replace the unbalanced reciprocating motion of the steam locomotive.

A road in England and also one in Canada is now under construction while active negotiations are in progress for contracts to install several important Austrian and other Continental main line roads, as well as the Vienna City underground, which is now operated with steam locomotives.

A 125-Ton Capacity Coaling Station.

The accompanying illustration shows a 125-ton capacity coaling and sanding station built by Tate, Jones & Company, Pittsburg, for the Terre Haute & Indianapolis Railroad at Effingham, Ill. The plant consists of a



125 Ton Coaling Station for the Vandalia at Effingham, Ill.

receiving hopper 30 ft. long and 19 ft. wide on top of the girder, having a capacity of 65 tons and placed underneath the track, into which coal is delivered either from hopper bottom cars or shoveled over the sides of gondola cars. It is fitted with a patent reciprocating feeder, shown in the illustration, by means of which coal is fed automatically and regularly from the receiving hopper to a belt conveyor.

The coal goes onto a belt conveyor equipped with Robins idlers carrying coal at an angle of about 19 deg. into the storage bin. This conveyor is driven by a steam engine and moves at 150 f.p.m. It has a capacity of 75 tons per hour.

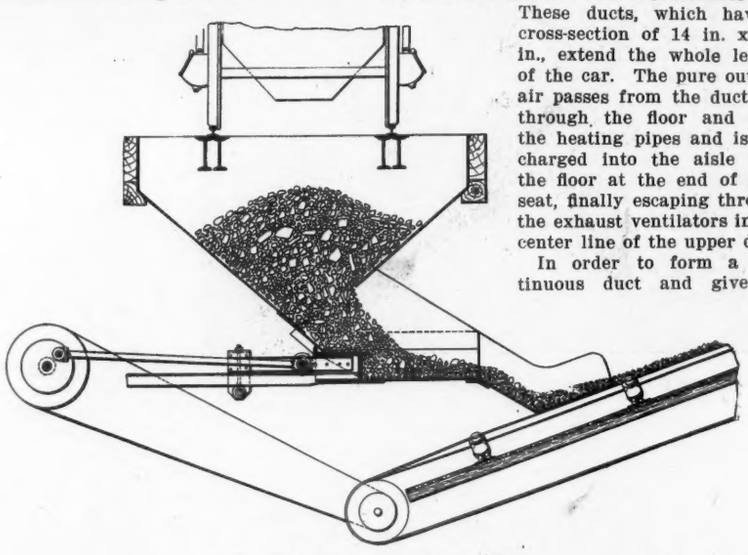
The coal is discharged from the belt conveyor at the top of the bin by a Tate & Jones patent automatic deflector. When the bin is empty the deflector discharges the coal at the sides of the bin bottom, and after the sides of the bin have become partly filled the deflector automatically reverses and discharges the coal toward the center of the bin. This prevents the coal from separating itself by gravity and eliminates sorting.

The storage bin is made of long leaf yellow pine, and is lined with $^{3}/_{16}$ in. plates hoppered in all directions toward the gates, eliminating any chance of fire by spontaneous combustion.

The coaling gates are both of the under and over cut type, and it is claimed that a locomotive may be coaled within a minute when so desired.

The sand bin has a capacity of 3½ cu. yds., or 4½ tons, of sand. The sand is dried at the ground level by a sand dryer and elevated by compressed air to the sand bin, from which it is drawn off to the locomotive by pipes and spouts equipped with cut-off sand gates designed so that the flow of sand cuts off immediately without leakage, the sand sealing itself in the gate.

The rail motor car service of the London & South-Western between Plympton, Plymouth and Saltash consists of two coaches coupled together with the engine compartments outwards and not adjoining one another. On the Yealmpton line, however, where the traffic is light, a single motor coach is used, some of the "haltes" or temporary platforms being only long enough for one car. This line runs parallel to the municipal electric tram-cars for the greater part of the distance between Devonport and St. Budeaux, and the competition is sharp. As in the service in the London district, passengers on the motor coaches get their tickets at the ticket office when boarding the car at any of the regular stations, but when taking passage at one of the "haltes" they pay their fares on the car.



Automatic Reciprocating Feeder.

Ventilation of Passenger Cars on the Pennsylvania.

The Pennsylvania has been making exhaustive tests and experiments during the last ten years in an attempt to design an efficient and satisfactory system of ventilation for passenger cars. A small pamphlet recently issued by the railroad company gives the results of many of the tests made and describes the details of the system which has finally been adopted and which is now being applied to all new passenger equipment on that road.

Early tests and analyses of the air in ordinary passenger cars and sleeping cars showed that only about one-sixth to one-tenth of the air necessary to maintain good hygienic conditions passed through the car; and the new system as finally developed, provides for 60,000 cu. ft. of air an hour, or 1,000 cu. ft. for each passenger, an amount sufficient for maintaining the best atmospheric conditions. In order to keep the cars at a comfortable temperature in winter weather with this volume of fresh air coming in, it was, of course, essential that the ventilating system be combined with the heating system in some way and the air warmed before it entered the body of the car. Another important consideration was the exclusion of dust, dirt and cinders as far as possible. Other experiments having shown that it is not possible to secure true ventilation by merely exhausting the air from the car by means of exhaust ventilators in the roof and allowing fresh air to enter where it can, the system designed provided for ample intake ventilators as well as outlets.

The accompanying illustrations reproduced from the pamphlet, show the system in outline. Air is taken in from the outside through the down-takes, located at diagonally opposite corners of the car, which are fitted with suitable hoods. It is forced into the ducts on each side under the floor which are formed by the floor, the false bottom, the side sill and the first intermediate sill. These ducts, which have a cross-section of 14 in. x 7½ in., extend the whole length of the car. The pure outside air passes from the ducts up through the floor and over the heating pipes and is discharged into the aisle near the floor at the end of each seat, finally escaping through the exhaust ventilators in the center line of the upper deck.

In order to form a continuous duct and give an unrestricted passage for the air currents, the usual cross bracing between sills is omitted and light iron braces are substituted. A shallow pocket is formed in the bottom of the air ducts to collect small cinders and dirt, which find their way

in through the intake hoods. Slots 12 in. long and 2 in. wide are cut in the floor between each two seats and directly under the steam pipes, which are enclosed in a box 5½ in. x 8½ in. The air coming up through these slots passes over the two steam pipes and divides, part going toward the galvanized iron discharge pipe under one seat and part toward the other seat.

During the experimental work attempts were made to take the heated air out from the heater boxing, through registers in the sides of the boxing, into the space between each two seats. But this was found to be so objectionable to the passenger sitting next to the window that it was abandoned. An attempt was also made to take the heated air out through apertures in the top of the boxing between each two seats, the idea being to have a current of warm air direct from the radiators pass up along the windows, to neutralize their chilling effect. It was found, however, that this aperture served as a convenient receptacle for materials thrown in by the passengers. Another scheme tried, during the experimental work, was to make the slots in the car floor 4 in. long and spaced 4 in. apart. The radiators were fitted with tin shields so arranged as to keep the air in contact with the radiators as long as possible, but none of these devices worked as well as the arrangement finally adopted.

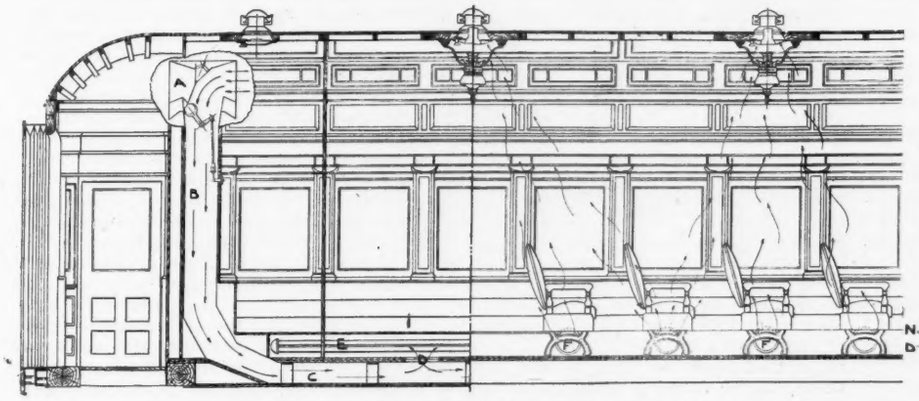


Fig. 1—Longitudinal Section of Car Showing Air Ducts and Intake.

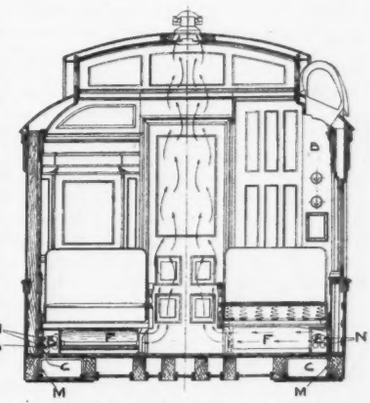


Fig. 2—Cross-Section of Car.

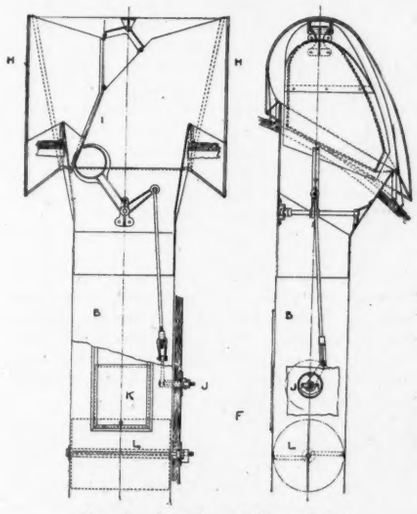


Fig. 3—Hood and Downtake.

The hood and down-take construction is shown in Fig. 3. A wire gauze "H" covers the two faces of each hood, the object being to exclude cinders of any appreciable size, especially such as might lead to incipient fires. The flap valve "I" is so manipulated that the air has a free passage into the down-take "B" from the direction in which the car is moving. This valve is controlled by a mechanism operated by the trainmen inside the car, the pointer on the operating device "J" indicating the direction in which the valve should be open. The door "K" in the down-take permits the operating devices for the flap valves to be connected, and also allows a chance for inspection. A strong downward current of air is perceptible when these doors are opened for a moment, while a car is in motion. The down-takes have each an area of about 100 sq. in. In the down-take just below the mechanism operating the flap valve, is a butterfly valve "L," by means of which it is possible to very nearly close the down-take. The normal position of this valve is open, the trainmen being instructed to close it only (1), when going through tunnels, in order to exclude foul air, or (2), when standing in stations with the locomotive detached and it is desired to keep heat in the car as long as possible.

The control of the ventilating system, by which the amount of air taken into the car is increased or diminished, is accomplished by means of the ventilators situated along the center line of the upper deck. The ventilators used are of the type known as the Globe ventilator. There are seven of these of the 6-in. size, five for use over the lamps, and one at each end of the car. The end ventilators differ somewhat in construction from those used over the lamps. Fig. 4 shows the end ventilator. It consists of a register valve and the ventilator itself, which is attached to the car roof. The apertures in the register, when the valves are open, are a little more than equal to the area of the 6-in. ventilator tube. When the valves of these end ventilators are closed, no air passes through except small leakages. The appliances for operating the valves are so arranged that when the valve handle stands lengthwise of the car, the valves are wide open; when crosswise, the valves are closed. The valve handle can have any desired intermediate position, with corresponding control over the amount of air passing through the ventilator. The ventilators over the lamps are shown in Fig. 5. They have the same essential parts, viz.: a register valve and arrangements for fastening to the car roof, and connecting with the Globe ventilator. They have in addition a smoke bell as an essential part of the register. The smoke bell is prolonged upward by a tube 3 in. in diameter, and it and the tube are never closed. The valve system surrounds the smoke bell, and is operated in the same way as that of the end ventilators. The smoke bell and its tube provide a constant opening of about one-fourth of the area of the ventilators over the lamps. The diminution in the amount of air passing through the car, however, when all ventilators are closed, does not correspond to these figures, probably due to leakages in the valves, and to greater velocity of air through the smoke bell, when the valves are closed.

During the experimental work, and on some of the first cars fitted up, the ventilators were all of the end type, and were located between the lamps. It was early found, however, that the lamp ventilators were very important and that they could not be ignored. With six ventilators of the end type, and five lamp ventilators, more air was taken through the car than could be warmed in severe weather, and accordingly on the first cars fitted up, the lamp ventilators were partially closed, only an aperture 2 in. in diameter being left for the escape of the lamp gases. This resulted in smoking the head lining, and accordingly the combined ventilator was devised for use over the lamps. The permanent 3-in. aperture in the combined ventilator disposes of the lamp gases very successfully. An essential feature of the arrangement is that all the ventilators may be closed, or all may be left open, or a part closed and a part left open, thus giving great flexibility to the system. The deck sash are not used as an aid to ventilation in any way and are made immovable.

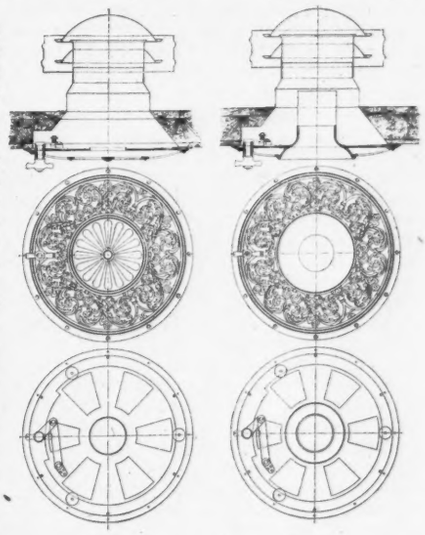


Fig. 4. *Fig. 5.*

Exhaust Ventilators.

The first tests made with a car fitted with this apparatus were intended to demonstrate whether the air currents would flow in the

direction desired when the car was standing still or whether the success of the system depended on the car being in motion. When there was no heat in the car and the lamps were not lighted there was, of course, very little movement of the air currents in either direction with the car standing, but when there was heat in the steam pipes or any of the lamps were lighted the air moved in good volume in the desired direction. The exhaust ventilators in the roof being 2 ft. higher than the intake hoods, the heated air rises to the top of the car and passes out through the roof, drawing the outside air in through the intakes instead of trying to find a way out in a reverse direction. The same explanation holds when a car has been standing on a siding in cold weather and is then put in a train and supplied with heat. The column of cold air between the car floor and the tops of the exhaust ventilators is longer than the column of cold air from the bottom of the air conduit to the top of the hood. All that is necessary is to open the end doors of the car and allow the cold air to pass out, when proper circulation begins.

Tests which were made to determine whether there was a vacuum or a plenum existing in the car when in motion showed that there was a slight vacuum from which it was expected that trouble might be experienced from draughts caused by cold air finding its way in through crevices around the car windows and also from contaminated air drawn out into the car from the closets in each end. As a precautionary measure a 4-in. Globe ventilator was put in the roof over each closet and no difficulty has been found in keeping the contaminated air out of the car; in fact, tests made while the car is in motion show a movement of air toward the closets rather than away from them.

In order to determine how much air the system would furnish, a car fitted as above described was loaded with men from the shops, who were paid for their time, and were under the charge of a foreman so that they could be controlled in the matter of opening doors and windows. With this car trips were made, from Altoona to Johnstown and return, a distance of about 40 miles each way. Rubber bags and hand bellows were employed to secure samples of the air in the car. Steam heat was necessary since the temperature outside was from 23 to 30 deg. Fahr., and neither door nor window was opened during the trip. The air samples for analysis were taken by pumping air into the rubber bags by means of a hand bellows, moving from one end of the car and back again in the aisle during the operation, and taking the air from about the level of the heads of the passengers. The analyses were made immediately after the return and always the same day. During this test there were 52 people in all in the car, including those who took the samples, and since they were full-grown working men the amount of carbonic acid given off per person was assumed to be 0.72 cu. ft. per hour. In making the air analyses carbonic acid only was determined, and from this was calculated the amount of fresh air taken through the car per hour by the ventilating system. The figures obtained are as follows:

Globe ventilators.	*Westbound.*	Per cent. of carbonic acid.	Cu. ft. of air per car per hr.
All Closed.	Bennington	0.18	26,700
All Open...	Buttermilk Falls	0.10	62,400
All Open...	Standing 20 min. at Johnstown..	0.21	22,000
	Eastbound.		
All Closed.	Cresson	0.14	37,400
All Open...	McGarvey	0.10	62,400
All Open...	Standing 20 min at Altoona ...	0.20	23,400

The stations mentioned denote locations at which air samples were taken. Bennington, on the schedule used, is about 23 minutes from Altoona; Buttermilk Falls is about 57 minutes from Bennington, and Johnstown is about 10 minutes from Buttermilk Falls. Returning, Cresson is about 42 minutes from Johnstown, McGarvey about 20 minutes from Cresson, and Altoona about five minutes from McGarvey. These figures give some idea of the interval between samples.

As has already been stated, the system was designed to supply 60,000 cu. ft. of fresh air per hour to a car. When all the Globe ventilators were open, that is when the system was working normally as designed, the actual amount of fresh air obtained was a trifle above the desired figure, as is shown by the samples taken at Buttermilk Falls and McGarvey. The actual amount of air supplied from time to time is affected by several conditions. The speed of the train has an influence, also the differences in temperature inside and outside of the car, and the direction and force of the wind. Just how much each of these variables amounts to is not known. When the Globe ventilators were closed, that is, when the designed control was applied, the amount of air supplied was cut down approximately one-half, as is shown by the samples taken at Bennington and Cresson. In other words, the control makes it possible to reduce the amount of fresh air when it is desired to do so, as for example when there are few passengers in a car, or in extreme cold weather, when the supply of heat may not be quite sufficient to warm the full volume of outside air. The samples taken at Johnstown and Altoona show what the system does, when a car is standing on the track, as at stations en route. It cannot, of course, be expected that the same efficiency be shown when the car is at rest as when it is in motion, and, in fact, this is not essential. The difference between the amount of air supplied when standing still and when the train is in motion, measures approximately the effect of the movement of the train on the system.

The heating arrangements for which the ventilating system was designed had 1 sq. ft. of heating surface for about 240 cu. ft. of ventilating air per hour when the system was in full normal operation. Under these conditions it is obvious that the temperature in the car is a function of the steam pressure maintained in the radiators and of the temperature of the outside air. If the amount of air supplied is constant at any given condition of the thermometer outside, the temperature inside will vary with the steam pressure; or, if the steam pressure is constant, and the amount of air also constant, the temperature in the car will depend on the outside temperature. In order to find out exactly what the system would do in the matter of car heating a car fitted as above described was run from Altoona to Harrisburg, a distance of about 132 miles, in January, when the temperature outside during the whole trip was from 10 to 13 deg. Fahr. above zero. The car was without passengers, in order to afford opportunity for manipulation. The steam pressure maintained, although not measured on this particular car, was, from readings on the gage on the locomotive, about 20 lbs. During the trip the following points were satisfactorily demonstrated: 1st. There is no difficulty whatever in keeping the car comfortably warmed in such weather with the ventilating system in full normal operation. The thermometer on the bell-cord hanger in the middle of the car, at no time throughout the whole trip, showed less than 70 deg. Fahr., and most of the time was from 73 to 75, and on one occasion reached 77 deg. (2d.) The distribution of heat throughout the car was entirely satisfactory. Thermometers in different parts of the car did not show differences of more than 2 deg. or 3 deg. (3d.) Diminishing the amount of air supplied to the car, increased the temperature, which was expected.

An interesting experiment was carried on during this run to determine the behavior of the air on the two sides of the car. There are hoods and down-takes on diagonally opposite corners of the car, one being, therefore, on the front end and the other on the rear end of the car when it is in motion; also each down-take connects with its own radiating system, and these are entirely independent, except that they take steam from the same point of supply. The indications obtained during the trip above mentioned would seem to show that the efficiency of the two sides of the car in supplying heated air when the train is in motion depends largely on the direction of the wind. With the wind dead ahead, both sides seemed to be equally efficient; with the wind ahead and from the right of the line of the train movement, the right-hand side of the car seemed to be most efficient, and with the wind from the left, the left-hand side of the car seemed to do most of the ventilating. The direction of the wind was noted by observing the locomotive smoke and the movement of the air by holding delicate anemometers at the air exits in the car under the seats.

Careful observations of temperature were made at another time during a trip from Philadelphia to Altoona, a distance of about 237 miles, with the thermometers outside from 2 to 5 deg. below zero Fahr. most of the distance. It was easy to keep the thermometer on the bell-cord hanger 70 deg. and above. No record was made of steam pressure on the car, but 30 lbs. were used on the locomotive. The windows were heavily frosted at starting, owing to a little leak in the steam pipes while the car was being warmed up in the station. This frosting entirely disappeared in the course of an hour and a half, owing to the constant passage through the car of dry warm air.

Another and even more severe test was made on a day train during the blizzard of February, 1899. This train was blocked by snow on the east end of Rockville bridge, near Harrisburg, for over four hours. The location gave full sweep for the wind blowing down the Susquehanna River. One of five trial cars was in this train, and during the time mentioned frequent observations were made on the temperature. At no time was any discomfort experienced, and at no time did the thermometer on the bell-cord hanger show less than 70 deg. Fahr.

In regard to the amount of steam required to warm the ventilated cars, no very positive data have been obtained. It is evident that more steam will be required than if the cars were not ventilated, but thus far no serious difficulties have been experienced. A few through trains having from three to five ventilated cars in them have been operated with perfect success for over a year.

If smoke, cinders, dust, noxious gases, etc., are suspended in or mixed with the air which comes to the hoods, they are, of course, taken in along with the air. Cinders, however, of any appreciable size, are excluded by the gauze over the hoods. Small cinders that pass the gauze are deposited in the conduit between the sills. The location of the hoods on the top of the lower deck greatly diminishes the annoyance from dust stirred up under the train. The smoke from the locomotive with the noxious gases which it carries is usually considerably higher than the hoods, or is diverted on one side of the train or the other by the wind. This leaves only long smoky tunnels to be especially provided for. The closure of the valves in the down-takes and the rapid change of air in the car by the system—only about four minutes

being required to completely replace the air in a car, after it has passed the tunnel—so greatly mitigate this difficulty that no serious trouble has thus far been experienced from the introduction by the ventilating system of objectionable matter from without.

Practical experience with the system on the road has thus far been very gratifying. Passengers and trainmen seem to find previous conditions much improved by the new system. The tendency to open the windows is diminished, and the cars are run comfortably with closed doors in the heat of summer.

This ventilating system has been applied on 800 cars running on the Pennsylvania Railroad and on 200 cars of the Pennsylvania Lines West as well as on a few cars of the Baltimore & Ohio. All new cars now building are fitted with it. As yet it has not been applied to a sleeping car.

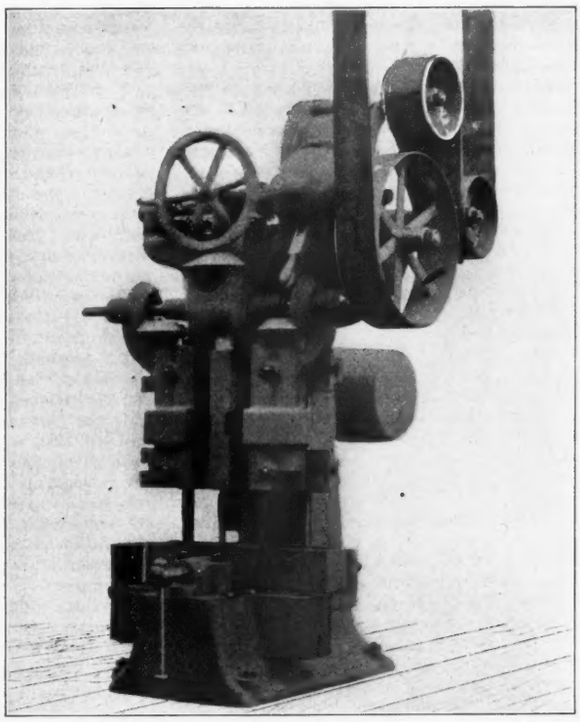


Fig. 1—The Sellers Rail Drilling Machine.

Railroad Shop Tools.

(*Continued.*)

RAIL DRILLING MACHINES.

Rail drilling machines are specially designed for drilling fish plate bolt holes in steel rails. A drill of this sort receives severe treatment and therefore must be made very strong with the spindle supported as close as possible to the drills. When drilling, the end of the rail is set against an adjustable stop and clamped in place by a vise. Very often these machines are set up in pairs, one right-hand and one left-hand. One machine is set up slightly in advance of the other and at a distance somewhat greater than the length of the rail. First one end of the rail is drilled and then the other. This class of machine is built with two, three and four spindles, the fourth spindle being an auxiliary. This auxiliary spindle is spaced about 6 in. from the main spindle, and carries a drill, which is used for drilling the bond wire holes in the rails.

The rail drilling machine shown in Fig. 1 is made by William Sellers & Company, Philadelphia, Pa. The spindles are adjustable from 3 in. to 12 in. from center to center. The work table is supplied with a vise which has an adjustable locking plate and reversible end stops. The drills are fed simultaneously by a feed gear operated by a positive clutch. The saddle is counterweighted and has quick hand adjustment. All gears are enclosed in gear cases. The fast and loose pulleys are 20 in. in diameter by 5½ in. face, and should run at 250 r.p.m.

The three spindle rail drilling machine shown in Fig. 2 is made by the Newton Ma-

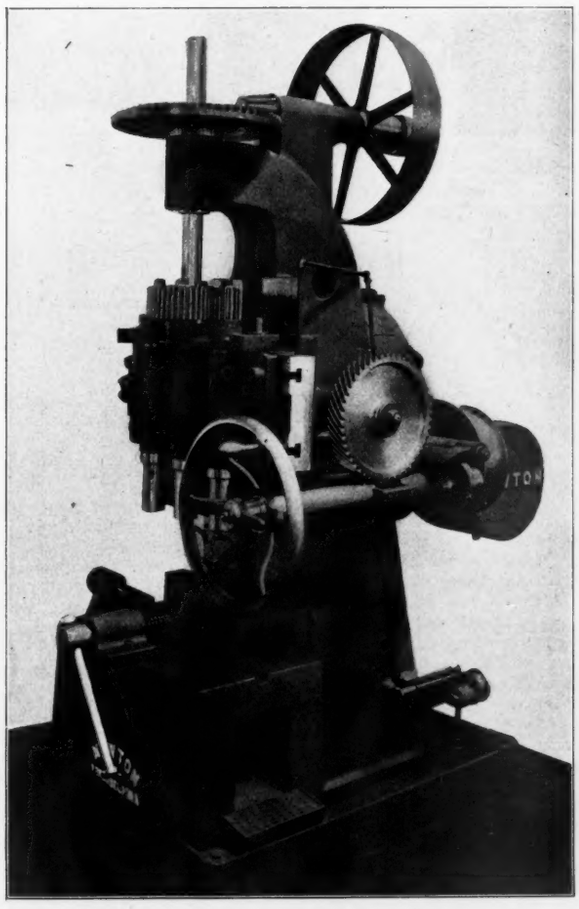


Fig. 2—The Newton Rail Drilling Machine.

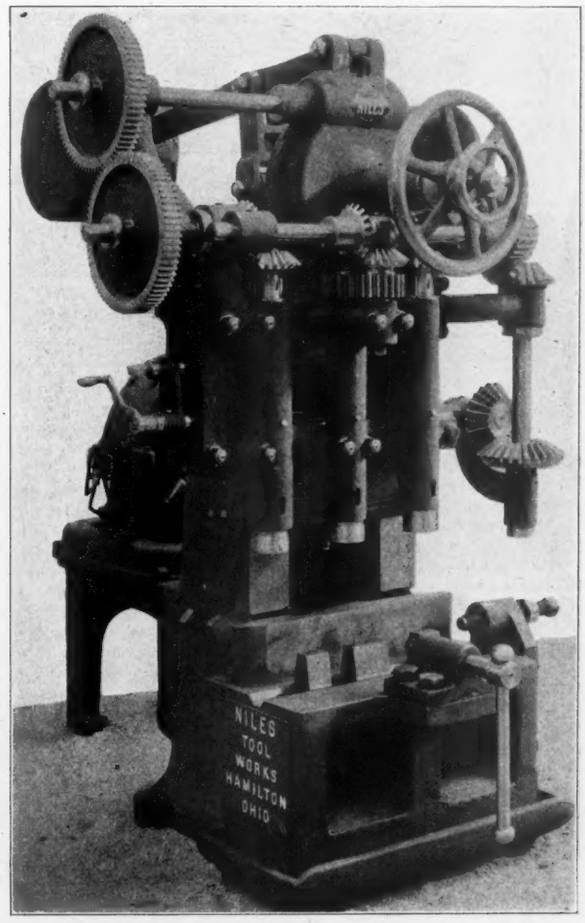


Fig. 3—The Niles-Bement-Pond Rail Drilling Machine.

chine Tool Works, Philadelphia, Pa. The spindles can be adjusted from 3½ in. to 9 in. from center to center. The spindles are carried on one saddle, which is counterweighted and feeds the three spindles simultaneously. Each spindle is made with a straight hole and sockets for adjusting the drills for different lengths. An adjustable vise is attached to the work table. There are two changes of automatic feed and a quick return motion for the spindles. The machine is supplied with a pump which circulates the lubricant for the drills. A pan in which the machine sets holds the lubricant.

The three-spindle rail drilling machine (Fig. 3) is made by the Niles-Bement-Pond Company, New York. This machine is shown motor driven. It has ample power to drill three 1¼ in. holes simultaneously. The minimum distance between centers of the spindles is 3½ in., and the maximum distance between the centers is 9 in. The maximum distance from the spindles to the base is 20 in. The spindles are contained in one sliding head, which has a horizontal adjustment. The head is also counterweighted, and has power down feeds, friction release and quick hand movements. Each spindle has an individual screw adjustment and the table is supplied with a vise and an adjustable end stop.

(To be continued.)

Oil Burning Furnaces.*

In the last 18 months all of the coal heating furnaces in the rolling mill, as well as the larger reverberatory furnaces used for large locomotive and marine forgings, have been converted into oil burning furnaces. The smaller furnaces in the bolt and nut factory, and the forging machine furnaces have also been converted into oil burning furnaces. The main question to be considered in comparing coal with oil for use in reverberatory furnaces is economy. This is governed by the price of fuel oil compared with coal as well as many other conditions that present themselves regarding economy.

The first question to be considered is the number of gallons of crude oil required to bring one ton of scrap iron, put up in piles varying from 200 to 1,000 lbs., to a welding heat. For a rolling mill in the Sacramento shops it requires 40 gallons of crude oil as it comes from the well (14 gravity) to heat 2,000 lbs. of scrap material or pile. In our old coal reverberatory furnaces, it required 500 lbs. of bituminous coal to heat the same quantity of metal. Furnace coal in this locality costs from $5.00 to $6.00 per ton; oil costing 1 cent per gallon, consequently the oil costs us 40 cents to heat one ton of metal while with our old coal furnaces it costs us $1.25 to bring the same metal to the required heat, or 68 per cent. saved in the cost of fuel alone.

The next thing to be considered is the handling of the two fuels. It requires six men to bring the coal to the reverberatory furnaces and bolt factory, from the coal pile. This alone costs $12.00 per day. Our oil tanks are arranged so that one man distributes oil over the whole works. Another thing to be considered is the hauling away of the ashes and cinders that are produced daily. It requires a horse and cart daily to remove this waste to the dumps. Another important consideration is the fireman. He has to handle between five and six thousand pounds of coal daily, clean his grate bars at noon and night, shovel out the ashes and cinders, and oftentimes knock out the brick work in the fire chamber trying to knock off the clinkers. All this hard labor is reduced 75 per cent. by the use of oil. The output of the furnaces heated with oil is at least 20 per cent. more than with the old-fashioned coal furnace. One reason for this is that there is no time lost in cleaning grate bars and wheeling out ashes.

The most important question relative to the two fuels is the quality of the iron produced from the scrap material. Hammered iron for railroad appliances, such as locomotive forgings or for any other purpose where the metal is subject to compression, tensile and vibrating and torsional strains, produced from oil fuel, is far superior than similar metal produced in the old style furnaces. Scrap material heated with oil finds less defect in working by lamination, than with iron brought to a welding heat with coal. We have had 50 per cent. less car axles condemned on account of seamy journals since we have adopted fuel oil in heating. This not only occurs with axles but with all other forgings.

With oil at 6 cents per gallon and coal at $5.00 per ton, the cost of operating a furnace about balances. Another important factor in the expense of operating is the power required to atomize the oil, and furnish sufficient oxygen to produce perfect combustion. Compressed air I find to be an expensive commodity. Steam is also expensive and is not as good as compressed air for the purpose. The old fan blast is the cheapest and best when properly applied. From eight to ten ounces pressure is all that is required for atomizing and perfect combustion. The success of oil burning depends on the shape of the interior of the furnace. In many cases the old method of providing a combustion chamber about 4 or 5 ft. from the bridge wall introducing the oil at the same end of the furnace and the heated gases passing over the bridge wall and coming in contact with the metal, the waste gases passing through the flue is used. The oil is forced into the furnace with compressed air or steam. Openings are left in the lower portion at the end of furnace, permitting the air to be drawn in. Another method is to carry the back wall four or five feet back of the original bridge wall, and build up several courses of perforated brick work a little above the opening made in the lower portion of the end of furnace, for the purpose of heating the air that is drawn in to form better combustion. After examining all the small bolt furnaces, I concluded, to try a different shape reverberatory furnace from any now in use. As an experiment I built the bridge wall up to and joining the roof, cutting out the old coal fire-place, building the roof straight near to the flue. Then I built a perpendicular wall down to the flue, introducing the burner about seven inches from the roof as shown herewith.

I lit the furnace using compressed air, and after one hour the heat was so intense that the slag commenced to pour through the slag hole. We then tried steam instead of air with good results in heating the iron. We still use the fan blast to furnish oxygen for combustion. Finally the fan blast was used exclusively for combustion, as well as for an atomizer. I find this method gives the best results. This furnace can be operated with compressed air, steam or the ordinary fan blast; however, I find the fan blast preferable. The same burner will answer in either case.

Fig. 1 in the accompanying illustration shows a horizontal section of the furnace through X of Fig. 3. Fig. 2 is a vertical transverse section taken through Y of Fig. 1. Fig. 3 is a longitudinal section taken through Z of Fig. 1. The burner passes through an aperture in the brick wall F, directly over the flue, blowing the oil in over the metal.

The furnace is 3 ft. beneath the hearth and furnace roof, this height giving plenty of room for perfect combustion by the time it reaches the wall C. A perfect incandescent flame then returns by the draft of the flue, as shown by the arrow points, and when mixed with the metal to be heated, the waste gases can be diverted under the boiler for producing steam, or through a stack as desired. Much care should be taken in placing the burner direct in line and about 7 or 8 in. below the roof so that perfect combustion will take place before the oil comes in contact with the iron on the hearth or the heated walls of the interior of the furnace. Should the oil come in contact with the roof or side walls, lumps of carbon will form, diverting the flame to such an extent that it will not flow in the direction required. The reason I mention this is that I had an unfortunate experience in this regard with my three-door rolling mill furnace. Through

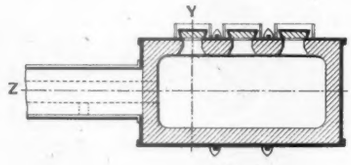


Fig. 1.

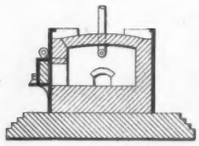


Fig. 2.

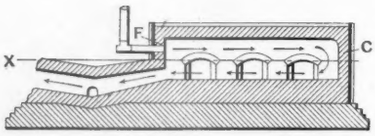


Fig. 3.

Reverberatory Heating Furnace.

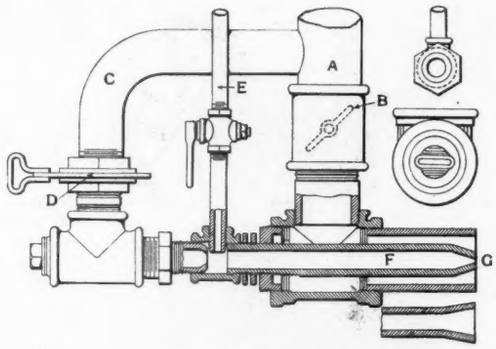


Fig. 4.

Low Pressure Oil Burner.

*Extract from a paper read by S. Uren (Southern Pacific) before the National Railroad Master Blacksmiths' Association, at Indianapolis, August 18, 1904.

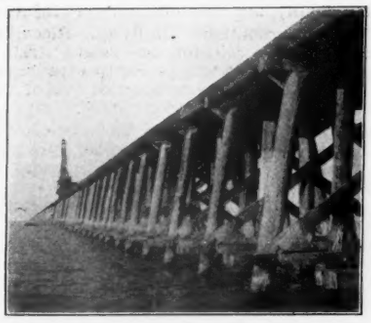
some accident the burner lowered on the outer end, causing the oil to strike the roof. A lump of carbon formed, diverting the flame towards the flue to such an extent that we could get the iron to the proper heat at the flue door only. As soon as the carbon was removed and the burner placed in the right position we had no more trouble.

The furnace shown in the illustration is a three-door rolling mill furnace. All our forging furnaces have two doors only, operated by the same method as the three-door furnaces. From my point of view this is the most simple and economical furnace now in use, as it is a perfect reverberatory furnace. Perfect combustion is produced and not a shadow of smoke can be seen from the stacks when properly manipulated. J. G. Camp, General Foreman of the S. P. shops at Sacramento, designed the oil burner (Fig. 4). This burner is used in 13 furnaces in the Sacramento shops. It is known as a low pressure burner and can be operated either with a fan blast as an atomizer with from seven to ten ounces of pressure; or it can be operated with steam or compressed air. When steam is used as an atomizer the blast pipe C should be removed and a steam pipe substituted. When compressed air is used a similar change should be made. (A) represents the fan blast pipe. (B) regulating gate in blast pipe. (C) air pipe leading from blast pipe to the outer end of burner pipe. (D) gate to regulate the blast passing into the burner pipe. (E) oil pipe connecting the burner pipe. (F) oil and wind pipe or burner pipe. (G) outlet to oil and burner pipe.

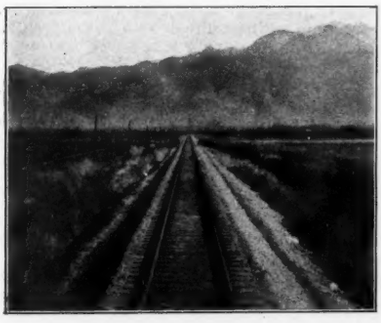
The German Ministry of Justice has made up a list of "railroad accident experts," 590 in number, for the use of the courts when they have to try men for causing accidents. This is expected to enable the courts to hear experts not attached to the particular line where the accused is employed.

Ogden-Lucin Cut-Off.

On September 18, the Ogden-Lucin cut-off of the Southern Pacific across Great Salt Lake was opened for regular passenger service. Although the engineering features of this work have already been described at length in the *Railroad Gazette*, now that the cut-off is in full use by the overland trains, a brief review and photographs of the finished work may be of interest. The cut-off was begun in June, 1902, and the official ceremony marking the completion of track-laying occurred in November, 1903. At this time the cut-off was not entirely finished, and it was not until March, 1904, that the new line was opened for freight trains. Even at this date, there still remained some riprapping and filling to be done, so that the company did not open the entire line for regular schedule passenger trains, the tracks being needed much of the time for work trains. For the present, the passenger schedules are not fast, some minor work still remaining to be done. Local passenger trains will continue to be run over the old route via Promontory. The Ogden-Lucin cut-off comprises 102.9 miles of new track, replacing 146.7 miles of track around the old North Shore route via Promontory, saving 43.8 miles in distance, 3,919 degrees of curvature and 1,515 ft. of vertical grade. The sharpest curve on the new line is 1½ degrees; on the old road, there were some of 10. On the cut-off the ruling grade is but 21 ft. to the mile, as against 90 ft. on the old route. The new line has 22.9 miles of trestle, of which 11.1 miles is permanent and 11.8 miles temporary. The permanent trestle, which has a ballasted deck, stands in from 30 to 34 ft. of water at the present level of Great Salt Lake. The accompanying photographs show examples of the excellent ballasting which is to be found throughout the line. The track is laid throughout with 80-lb. rails. On the trestle portion, the ballast (gravel) is 15 in. thick under the ties.

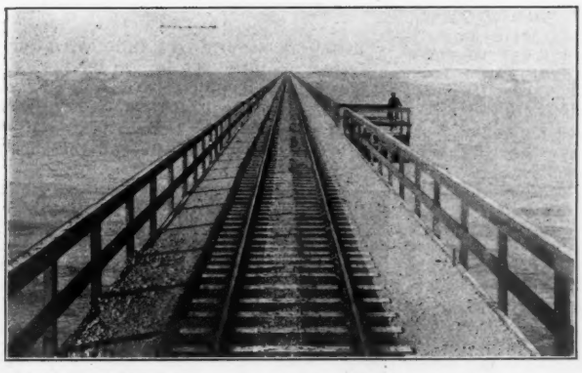


Temporary Trestle, Ogden-Lucin Cut-Off.

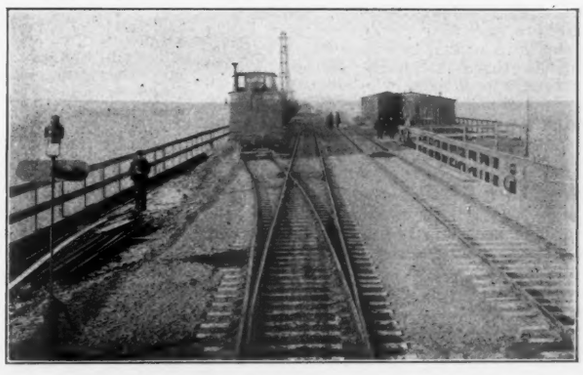


Looking West Toward Wasatch Mountains.

Fill Across East Arm of Great Salt Lake, Ogden-Lucin Cut-Off.



Permanent Trestle Across Great Salt Lake, Ogden-Lucin Cut-Off.



Permanent Trestle and Roadbed at Midlake.

Train Accidents in the United States in August.[1]

eq, 2nd, Louisville & Nashville, Breton, Ky., a passenger train was derailed by the breaking of a flange and two passenger cars were ditched; conductor and four passengers injured.

unx, 2nd, Central Vermont, Norwich Town, Conn., a passenger train was derailed and the engine and baggage car fell down

[1]Accidents in which injuries are few or slight and the money loss is apparently small, will as a rule be omitted from this list. The official accident record published by the Interstate Commerce Commission quarterly is regularly reprinted in the *Railroad Gazette*. The classification of the accidents in the present list is indicated by the use of the following

ABBREVIATIONS.

rc	Rear collisions.
bc	Butting collisions.
xc	Miscellaneous collisions.
dr	Derailments: defects of roadway.
eq	Derailments: defect of equipment.
dn	Derailments: negligence in operating.
unf	Derailments: unforeseen obstruction.
unx	Derailments: unexplained.
o	Miscellaneous accidents.

An asterisk at the beginning of a paragraph indicates a wreck wholly or partly destroyed by fire; a dagger indicates an accident causing the death of one or more passengers.

a bank. The engineman, fireman and five passengers were injured.

bc, 3rd, 11 p.m., Louisville & Nashville, Horse Cave, Ky., butting collision between southbound passenger train No. 1 and northbound passenger train No. 2, wrecking both engines, one baggage car and one mail car. The engineman of No. 1 was killed and four trainmen and 16 passengers were injured. It is said that No. 2 was entering a side track, following a freight train which had entered a minute before, and that the engineman of No. 1 took the headlight of the freight for that of the passenger train.

4th, 4 a.m., St. Louis & San Francisco, Vinita, Ind. T., a passenger train was derailed, and the tender and five of the six cars were ditched. Twelve passengers were injured.

4th, Chicago, Peoria & St. Louis, East St. Louis, Ill., a passenger train of the Illinois Central was derailed at a switch and five of the seven cars were ditched. It is said that none of the persons on the train were seriously injured.

eq, 5th, Baltimore & Ohio, State Road, Ohio, a freight train was derailed by the breaking of a journal and five cars were wrecked. A trespasser riding on one of the cars was killed.

dn, 5th, West Jersey & Seashore, Woodbury, N. J., express train No. 5 was derailed at a misplaced switch and the engine and three cars were wrecked. The engineman, fireman and four passengers were injured.

5th, Texas Southern, Winnsboro, Tex., a freight train was derailed on a bridge and 10 cars fell through to the stream below.

xc, 6th, Houston, East & West Texas, Garrison, Tex., passenger train No. 1 ran over a misplaced switch and into some freight cars standing on a side track, damaging the engine and one car. Eight passengers were injured.

7th, Southern Railway, Elk Valley, Tenn., a passenger train was derailed and the baggage car and three passenger cars were overturned. Three trainmen and nine passengers were injured, all of the passengers slightly.

†unf, 7th, 8.45 p.m., Denver & Rio Grande, Eden, Colo., southbound passenger train No. 11 broke through a trestle bridge, which had been weakened by a flood, caused by a cloudburst a short time before, and the engine and first three cars fell into the swollen stream. The bodies of the cars were carried down stream a long distance. Eighty-four passengers and four employees were killed and the fireman and two passengers were injured, the three last named being the only survivors among those who went down with the wrecked cars and engine. There are still missing six persons who were presumably on the train but whose bodies have not been found. One dining car and one sleeping car remained on the track. This accident was reported in the *Railroad Gazette* of August 12, page 242. It is believed that parts of the bridge had been knocked down by the wreck of a highway bridge which floated down from a point up the stream.

8th, Vandalia Line, Plainfield, Ill., eastbound passenger train No. 21, running at high speed, was derailed and the engine and most of the cars were badly wrecked. The wreck fell against some freight cars standing on a side track and these were also badly damaged. The wreck took fire and, with two factories nearby, was burnt up. Fourteen passengers and six trainmen were injured. It is said that the derailment was due to a broken wheel or axle.

dn, 8th, 9 p.m., Louisville, Henderson & St. Louis, Spottsville, Ky., freight train No. 64 ran into an open draw and the engine and nine cars fell into Green River. The engineman, fireman and two tramps were drowned. The stop signals were properly displayed and the engineman's mistake cannot be explained.

rc, 8th, Southern Pacific, Cisco, Cal., a passenger train standing at the station was run into at the rear by a following freight train, wrecking a dining car and damaging several other cars. Two passengers were injured.

bc, 9th, Missouri Pacific, Fort Scott, Kan., butting collision between a freight train and a train consisting of an engine and a caboose. One fireman was killed and four other trainmen were injured.

†bc, 9th, Chicago, Ill., Western avenue and Thirty-ninth street, a passenger train of the Baltimore & Ohio ran into a freight of the Chicago & Erie at a crossing, wrecking several cars. The freight was moving backward and it ran against and overturned one of the passenger cars of the other train. Five passengers were killed, four of them belonging to one family, and seven others were injured.

bc, 10th, Southern Railway, Riceville, Tenn., butting collision of freight trains, wrecking 15 cars and injuring two trainmen. It is said that the engineman of one of the trains misread a telegraphic order.

unx, 11th, East Tennessee & Western North Carolina, Blevins, Tenn., a freight train was derailed on a high bridge, and six cars of lumber broke through and fell to the stream 60 ft. below. One brakeman fell with the cars and was severely injured.

bc, 12th, 11 p.m., Atlantic Coast Line, Elba Junction, Ala., butting collision of freight trains, wrecking both engines and many cars. One of the enginemen was killed and five other trainmen were injured. It is said that the eastbound train had disregarded a meeting order.

unf, 12th, Pennsylvania road, Dunlo, Pa., a passenger train moving backward was derailed by running over a cow, and a track foreman riding on the front of the leading car jumped off and was killed.

12th, St. Louis Southwestern, Texarkana, Ark., passenger train No. 5 was derailed at a switch, and the engine and first four cars were wrecked. The engineman and fireman were fatally injured. A sick employee in the baggage car died soon after the accident, and one mail clerk was injured.

dr, 14th, Central of New Jersey, Elizabeth, N. J., a passenger train was derailed by a loose rail, while running at low speed, and the engine was overturned. The engineman was killed and several passengers were injured.

†eq, 14th, Tennessee Central, Silverpoint, Tenn., passenger train No. 2 was derailed by the breaking of the flange of a wheel of the last car, and two passenger cars were wrecked. One passenger was killed and 25 were injured.

unx, 17th, Chicago, Rock Island & Pacific, Altamont, Mo., a passenger train was derailed and the baggage car and two passenger cars were overturned and fell down a bank. Fourteen passengers and three trainmen were injured, two of the latter fatally.

†unx, 17th, Atchison, Topeka & Santa Fe, Scranton, Kan., a special westbound passenger train was derailed and ditched. Twelve passengers were injured, one of them fatally.

bc, 18th, Southern Ry., Seneca, S. C., butting collision between a freight train and a work train, wrecking both engines and several cars. One fireman and three other trainmen were injured, the fireman fatally.

bc, 18th, Cleveland, Cincinnati, Chicago & St. Louis, Elizabethtown, Ohio, butting collision between two trains, each of which consisted of an engine and a caboose, badly wrecking both. One engineman was killed and eight other trainmen were injured.

unf, 18th, Illinois Central, Bogue Chitto, Miss., a freight train was derailed at a washout, and the engine was overturned. The fireman was killed and the engineman injured.

unf, 20th, 1 a.m., Pennsylvania road, Conewago, Pa., the third section of train No. 19, composed of express cars, was derailed by a rock which had fallen on to the track in a cut, and the engine and first four cars fell down a bank. The engineman, fireman, conductor and one express agent were injured, the latter fatally.

bc, 22d, Norfolk & Western, Kenova, W. Va., butting collision of freight trains, wrecking both engines and several cars. Two tramps were killed and the conductor and engineman were injured, the latter fatally.

xc, 22d, 3 a.m., Massillon, Ohio, a freight train of the Baltimore & Ohio ran into a passenger train of the Wheeling & Lake Erie, at the intersection of the two roads, and one passenger car was badly damaged. A brakeman of the passenger train was killed and one passenger was injured.

bc, 23d, Chicago, Burlington & Quincy, Violet, Neb., butting collision between passenger trains No. 15 and No. 16, badly damaging both engines. Seven passengers and two trainmen were injured. It is said that one of the trains approached the station at excessive speed by reason of some difficulty with the air-brakes.

unx, 23d, Chicago, Rock Island & Pacific, Princeton, Mo., westbound passenger train No. 3 was derailed and 40 passengers and three trainmen were injured.

unx, 23d, 1 a.m., Atchison, Topeka & Santa Fe, Topeka, Kan., passenger train No. 17 was derailed and all of the cars except one were ditched. A mail clerk and express messenger, one passenger and a tramp were injured, the latter fatally.

bc, 24th, St. Louis & San Francisco, Sarcoxie, Mo., butting collision between a passenger train and a freight; 11 passengers injured.

bc, 27th, Lake Shore & Michigan Southern, Sturgis, Mich., butting collision between a westbound passenger train and an eastbound empty engine; engineman, two mail clerks, and one passenger injured.

xc, 27th, Texas & Pacific, Fort Worth, Tex., a passenger train collided with some freight cars, and one passenger and three trainmen were injured.

unf, 27th, Seaboard Air Line, Pee Dee, N. C., a freight train was derailed at a culvert which had been washed out, and the engine and nine loaded cars were wrecked. The engineman and fireman were killed.

bc, 28th, Baltimore & Ohio, Hayes, Pa., butting collision between a passenger train and a freight, badly damaging both engines and several cars. Ten passengers were injured.

30th, Chicago, Milwaukee & St. Paul, Bardwell, Wis., a freight train was derailed at a derailing switch and the engine and 18 cars were wrecked. The engineman, fireman and one brakeman were injured.

Time Package Freight on the Southern.

Last week we printed a full description of a system recently put in use on the Canadian Pacific for promptly despatching and carefully keeping track of fast through freight shipments. The Southern Railway has in use a less complete and complicated

Fig. 1—Red Card for Time Package Cars.

system which is applied to all cars requiring quick transit such as refrigerator cars containing vegetables, fruit, meat, poultry, eggs, beer, etc. A large part of the freight business of the Southern is made up of shipments of fruit and vegetables to the northern markets and of meat south. All cars loaded with such commodities are forwarded with one of the cards shown in Fig. 1 tacked on the door on each side of the car. This card measures 9 in. x 14 in. and is printed

in red with white letters and blank spaces. The card is properly filled out with blue pencil with the destination, originating point and date and train number in which the car was forwarded. If the car or cars originates at a station between division points the agent fills out the form shown in Fig. 2 and telegraphs the report to the Superintendent of Transportation as soon as the train taking the car has left the station. When a train leaves the yard at each division point the yard foreman makes out one of these reports showing all the cars of package freight in that train and this is telegraphed in, the same as the agents report. In case a car is set out for any reason, the Superintendent

SOUTHERN RAILWAY COMPANY.

_____ DIVISION.

_____ 190

SUPERINTENDENT OF TRANSPORTATION,
WASHINGTON, D. C.

Below please find correct list of all cars loaded with Vegetables, Fruit, Melons, Poultry Eggs, Beer, etc., Received from

*A *B *C

_____ Train No. or Connecting R. R. (Time)_____ M._____ 190

*D *E *F

forwarded by Train No._____ Section No._____ or Delivered_____ R. R.

*G *H *I

leaving here at_____ o'clock_____ M. (date)_____ 190

*J INITIAL.	*K NUMBER.	*M CONTENTS.	*N FINAL DESTINATION.	*O RECEIVED AT	*Q EXPLANATION OF ANY DELAY.
1					
2					
3					
4					
21					
22					

_____ *Agent or Yardmaster.*

INSTRUCTIONS.

This report to be made up by *Yard Foreman* or *Agent* and telegraphed to Superintendent of Transportation as soon as train leaves his station.

Cipher letter "O" Received at, to show connection received from or local starting point on line of Southern Railway.

Make full explanation of any delay.

If Cars are transferred, show Car Number and Initial into which transferred.

Operators will transmit only written portion of this report, and use Cipher Letters for that purpose indicated thus*.

Fig. 2—Form for Reporting Departure of Time Package Cars.

of Transportation is informed by wire immediately, and when the car is picked up, the fact is noted in the yard foreman's report at the next relay point. The car service office, knowing the destination of each car, can follow up its movement with little labor by checking over the successive reports from relay points. For a comparatively short road such as the Southern, where trains are not on the road more than two or three days at a time, this system is well adapted. The more complicated system of the Canadian Pacific avoids confusion and delay on a road where trains are often a week or ten days en route from terminal to terminal.

We are indebted to Mr. J. N. Seale, Superintendent of Transportation of the Southern Railway, for the forms shown and information furnished.

Motor Cars as Feeders to Railroads.*

After a general discussion on motor cars and motor car working, Mr. Campiglio cites the following specific instances of the use of motor cars as feeders to steam railroads. A public service with five motor cars is in operation at Speyer in Germany. In 1900, these motor cars conveyed 100,000 passengers in making eight daily trips, out and return, on two of the lines, and four on another line, which forms a continuation. The average daily run of each car was 37.3 miles. The cars weigh 15,430 lbs. each; they carry from 18 to 20 passengers seated inside, and eight standing on the rear platform. They have 10 horse-power two-cylinder motors, and this is enough during the good seasons of the year. But owing to the bad state of the roads in winter, the management advises that in similar cases 12 to 14 horse-power motors should be employed.

In winter it becomes difficult to keep the service going, as the resistance is much greater owing to the bad state of the roads, and it is then necessary to reduce the speed, or else the motor may fail to act. When there is snow, there is even more trouble, and it is necessary to fit special tires to the wheels. But if the snow is very deep and soft, these tires are no longer effective; this is a very rare case, however, and in the service in question has only happened once in the winters of 1899-1900 and 1900-1901. Trouble has arisen in winter through the freezing of the cooling water, but this has been overcome by adding a certain proportion of glycerine to the water. This in its turn makes everything dirtier.

In this service, later on, open trailers weighing 3,300 lbs. were used in summer; the trailer had twenty seats, so that the motor car and trailer together could take about 50 passengers. The trailers were coupled up by a sort of fork so arranged that the trailer followed in the same track as the motor car. In addition two safety chains were used. The trailers have solid rubber tires, which make them run very smoothly, and the public preferred the trailers to the motor cars. This service, which has now been running for over three years, is carried on regularly and the management states that it is quite satisfied with its motor cars, with the reservation that if any new cars are required the power should be increased to 14 or 15 horse-power, particularly if trailers are to be used.

A service of motor cars with Daimler petrol motors was started last summer, between Genoa and Torriglia, 21.7 miles, on a rising gradient. The distance was covered in two hours and a half up and in one and a half down. The car bodies were apparently subjected to too great loads, so that repairs became necessary.

Another public service, of three Daimler cars with 18 seats each, was run between Cortina di Ampezzo and Toblak (Tyrol), over a distance of 19.3 miles. It was stopped because it did not pay, and it is impossible to obtain any further particulars as the company which ran it has been broken up.

A motor car service (petrol motors) about which information is available, is that of the *Société Anonyme des Messageries Francaises Automobiles* in Tunis. It has five Panhard cars, of 16 horse-power, which can carry a load of 3,300 lbs. (sixteen passengers and luggage) at an average speed of 13.7 miles per hour if the roads are in their ordinary condition. The back wheels of these cars have iron tires, the front ones solid rubber tires. The cost of maintenance has been estimated to amount to $4.00 per car per day, the car making a daily run of 62 miles. It is assumed that the cost of renewals: wheels, etc., up to the end of the year will certainly not average $10.00 per day, and it is estimated that the solid rubber tires will run 18,640 miles before they will have to be renewed. An experimental motor car service (Dietrich petrol cars, with 12 seats) has also been organized between Luneville and Blamont.

A service of motor cars, with de Dion-Bouton steam motors, has been organized at Rouen by the *Compagnie des Messageries Automobiles*. There is a regular service of three omnibuses, two of 35 horse-power and one of 25 horse-power. The cars have been running about a year, with satisfactory results. There was occasional trouble in winter, during times of rain and snow; nevertheless, though the runs amount to 25 and 31 miles, the cars were never more than about three-quarters of an hour late. The average speed is 7.5 miles per hour, whereas it should amount to from 10 to 11.2 miles per hour. Concerning the motors, the management recommends that great care should be paid to the boilers: "It is advisable to clean them out with steam every evening, to scrape out the spaces between the tubes every week and to take out the tubes frequently." Another recommendation is to have a spare boiler to each two cars, so as to make it possible to replace the boilers whenever necessary.

It is estimated that 15 or 16 lbs. of coke

*Extract from a paper by A. Campiglio, President of the Italian Union of Light Railways, in the Bulletin of the International Railway Congress.

are burned per mile run and that 3½ lbs. of grease, 3½ lbs. of cylinder oil and 4½ lbs. of lubricating oil are consumed for every hundred miles run. The crew of each car consists of a skilled driver and a fireman, and in Italy a service of steam motor cars made by the same firm is run between Spoleto and Norcia, 31 miles, over a very undulating road, which is 1,050 ft. above sea level at Spoleto and then rises to a maximum of 2,400 ft., goes down to 1,093 ft. and then up again to 1,980 ft. above sea level. The grades average from 5 to 6 per cent. and in some places are as high as 7½ per cent. The service was inaugurated Oct. 26, 1902, with motor cars which could carry 22 passengers. The boiler is of the multitubular type, with a heating surface of 48.44 sq. ft., and the maximum pressure is 256 lbs. per sq. in. The power is transmitted through a jointed shaft and bevel gear to the back wheels, which have tires $4^{5}/_{16}$ in. wide.

The cars can carry a load of 6,600 lbs. and their maximum running speed is from 9 to 11 miles an hour, which is reduced in ordinary practice to 7⅘ miles an hour, the cars making the run from Spoleto to Norcia in four hours, whereas horse vehicles took six hours. The cost of each car is about $5,200. The cost of working during the first 72 days, during which a total distance of 5,650 miles was run, was as follows:

Wages	$1,675
Fuel	506
Lubricants	98
Lighting	17
Cotton, waste, etc.	9
Maintenance	71
Total	$2,376

But some exceptional circumstances entered into this table, and it is estimated that in original circumstances wages would work out at the rate of about 9 cents per mile run, fuel at about 6 cents, lubricants at about 1½ cents, maintenance at about 2⅘ cents and interest, sinking fund, general expenses and insurance at about 11¾ cents.

A detailed comparison of the cost of conducting a run of 9¼ miles on fairly level country where horse traffic can be run which would obviate the necessity of using extra horses on any of the steeper grades shows quite an economy in favor of the motor car service, entirely apart from the additional advantage of the higher speed. The author estimates that to run a three-trip-per-day service of horse vehicles under the ordinary conditions as to price of horses and carriages existing in upper Italy requires a capital expenditure of approximately $8,200 and a daily expenditure of approximately $13, while a similar service with motor cars requires a capital expenditure of about $9,600 in the first instance, but a daily working cost of only about $12. This is calculated on the assumption that the average day's work per horse is about 19 miles.

The author considers that the motor car is, however, not to be considered as a possible rival of the electric interurban line, but rather as a co-operator in its development. In cases where the electric road cannot be built because of the doubts as to its success, a motor car service can determine how much traffic there actually is and develop it without heavy expense, since the motor car can be run elsewhere as soon as the electric road is built and takes care of the traffic previously developed.

As to the respective use of steam and petrol motors, the author believes that the explosion engine is the most satisfactory. For the same number of passengers, the same speed and the same length of run, without requiring fresh supplies, the petrol cars are lighter than the steam cars, and by a small increase of weight, their speed can be materially increased, while the steam motor requires a much more considerable increase in the dead weight and in the supply of fuel and of water. It may be asserted that steam motors have been improved nearly up to their possible limit and that, owing to their unavoidably great weight and the cost of the material of which they are made, there is no reasonable hope that their cost can be materially reduced. On the other hand, explosion motors are still in an initial stage and a considerable reduction in their mechanism may certainly be expected from the simplification of manufacture due to the intense competition which prevails.

In petrol motors, there is another advantage which has to be taken into account, and that is that they can always be started at once, whereas a steam motor requires about three-quarters of an hour before a sufficient head of steam can be accumulated to start. If at any time in public service it is necessary to start a reserve car owing to a sudden rush of traffic or to replace a broken-down car, this can be done much more quickly with an explosion motor than with a steam motor.

The Weir Frog Company's New Works.

The accompanying illustration shows the floor plan of the Weir Frog Company's (Cincinnati) new shops at Norwood, Ohio. The plant was designed by Bert Baldwin & Co., architects and engineers, of Cincinnati and New York.

The buildings are two, two-story brick buildings 100 ft. by 60 ft., one used for general offices and draughting room, and the other with men's wash and locker room on the first floor, and pattern shop and storage room on the floor above. Each of these buildings is connected to the shop by covered passage ways.

The main shop is a single story brick building, 125 ft. wide and 662 ft. long, having an area of nearly 83,000 sq. ft. under the roof. The main aisle is 61 ft. 2 in. span, and the two side bays are 31 ft. wide. The roof is carried by steel truss supported on steel columns. The light comes from the windows in the side walls, which are set about 6 ft. above the floor, from the four skylights in the roof, and the side windows above the roof of the bays. The shop is heated throughout by the American Blower Company, Detroit, Mich. and the Webster vacuum systems, using exhaust steam from the engine. The erecting and main machine floor is 125 ft. by 260 ft., it has a concrete and cement floor, as have also the drill press, engine, filter and boiler rooms.

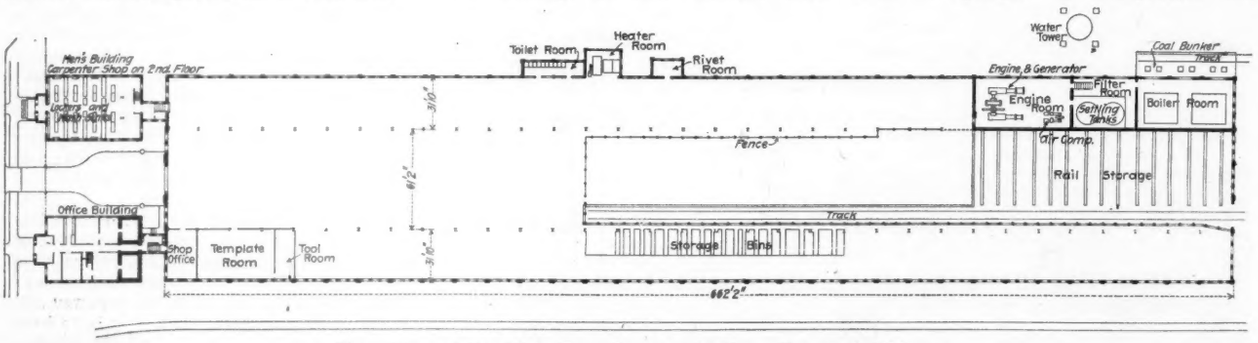
The 60 ft. span is served by two electric cranes made by the Case Mfg. Company, Columbus, Ohio. One is used principally to load and unload cars, and the other to supply the erecting floor and machines with material from the stock department. On this floor are the planers, straightening machines, and some special machines.

Beyond the erecting floor is the stock department, where is kept all the material received into the shop. Into this end of the building is brought the railroad track, which holds ten cars, and is set enough below the general level to bring shop floor even with level of the car floor.

The stock department is 60 ft. by 400 ft., and is enclosed by a fence, and is in charge of a stock-keeper. The heavy material such as rail, plates and bars, are piled on the floor. Small supplies like rivets, bolts, nuts, etc., are placed in storage bins.

The forge department, on the south side of the main building, is equipped with forging machines, presses, hammers, heating furnaces, and blacksmith fires. On the north side of the building, opposite the forge department, are located special tools for bending, curving and drilling rails, etc.

The power plant consists of a 500 h.p. Brown automatic compound engine, made by I. & E. Greenwald Co., Cincinnati. This is direct coupled to a 300 k.w. Bullock generator, made by the Bullock Electric Mfg. Co. (Allis-Chalmers Co.), Cincinnati; the current is 220 volts. Every machine in the shop has an individual Bullock motor, except a few small machines taking power from a line of motor driven shafting. An Ingersoll-Sergeant air compressor made by the Ingersoll-Sergeant Drill Company, New York, furnishes power for riveters and pumping water. An 8 in. artesian well, 320 ft. deep, supplies all the water used for boilers or other purposes. The water is pumped by compressed air and stored in an elevated tank 60 ft. above the ground, with a capacity of 20,000 gallons. This was erected by Flint & Walling Mfg. Company, of Kendallville, Ind. The floors of the filter and boiler room are 10 ft. below the level of the engine room floor, and about 8 ft. below level of outside ground. All coal is received in hopper bottom cars, and dumped direct on the floor of the boiler room. There are four 250 h.p. boilers made by The Sterling Company, Chicago, Ill. These are equipped with American stokers, made by the American Stoker Co., Erie, Pa. The well water is softened and filtered by the Wefugo process, and heated in a Webster exhaust steam heater made by Warren Webster & Co., Camden, N. J.



Floor Plan of the Weir Frog Company's Shop, Norwood, Ohio.

GENERAL NEWS SECTION

THE SCRAP HEAP.

Thirty-four locomotives have been transferred from the Union Pacific to the Southern Pacific, to be used on minor lines of the latter.

Mr. E. P. Bacon has called another convention of the "Interstate Commerce Law Congress"; it is to be held in New York City October 28.

A rule requiring storage to be charged on L. C. L. freight in freight houses has been adopted at all of the stations governed by the Missouri Valley Car Service Association.

The Union Pacific announces that on the Overland Limited trains news bulletins will be posted each afternoon in the buffet cars. All the important news will be bulletined, being sent by telegraph over the railroad company's wires.

The Indiana Shippers' Association, of Indianapolis, Ind., has had prepared an elaborate bill for the establishment in that State of a State railroad commission. The bill is published in full in the *Indianapolis News* and it is to be presented to the next Legislature.

The Pullman Company now requires its 5,000 car cleaners to wear uniforms; and in conjunction with the order making this requirement the company presents to each workman three complete suits. It will also have the suits washed at its own laundries, free of charge.

Newspaper reports from Vinita, Ark., state that a pier of the steel bridge being built over the Grand river at Carry's ferry, ten miles east of Afton, collapsed Sept. 22, killing two persons, fatally injuring three and injuring 21 others. The accident was due, it is said, to the faulty construction of one of the piers.

The bridge over Lake St. Croix, near Stillwater, Minn., which is half a mile long, extending to the Wisconsin shore, was damaged by fire September 15. One of the spans fell, carrying about 20 persons with it into the water; and two persons were killed and five seriously injured.

The number of men now employed by the Baldwin Locomotive Works, Philadelphia, is about 9,000. The high tide of activity was nine months ago, when there were 15,000 men at work, and the shops were running from midnight on Sunday until midnight on Saturday, turning out 15 locomotives every two days.

Officers of southern and eastern railroads at Chicago are reported as saying that the increase in general traffic, noted during the fore part of the month, has let up a little. They attribute this to the practical cessation of heavy shipments of grain and in part to a rather less optimistic feeling in business circles as a result of recent widespread talk of serious damage to crops in the west.

At Melrose, Mass., on the evening of September 21, nine persons were killed and 15 injured, some of them fatally, in the wreck of a street car by an explosion of dynamite. The dynamite (about 50 lbs.) was in a box which had fallen on the track from a truck wagon, the driver of which appears not to have discovered his loss until he reached his destination.

Chicago despatches of last Monday say that the Pullman Company, which about two weeks ago dismissed all but a handful of its men from the shops at Pullman, has re-employed 2,000 of them at wages from 10 per cent. to 20 per cent. less than they formerly received. The work to be done now is mostly repairs. It is said that the men now taken on have been selected with discrimination, and that individuals known to be labor agitators have been carefully left out.

The number of cars handled in the building and equipping of the Louisiana Purchase Exposition, is reported as follows: To July 31, 3,193 car loads of exhibits; 1,805 less than car loads; 17,582 car loads of construction material; 1,319 car loads of coal; 112 car loads of supplies. Total, 24,011 car loads. For August—Fifty car loads of exhibits, 70 less than car loads, 84 car loads of live stock, 200 of construction material, 343 of coal, 76 of supplies. Total, 823 car loads.

The New York Railroad Commissioners, reporting the results of their inquiries into complaints made against the New York, New Haven & Hartford, decline to recommend any increase in the number of passenger trains to and from the Grand Central Station, this on account of the already congested condition of the station. Complaint had been made that passengers have to ride in baggage cars, but the Board finds that they do this from preference.

To meet the demands of the people of Mount Vernon and New Rochelle, N. Y., which cities have passed severe ordinances for the suppression of the smoke nuisance, the New York, New Haven & Hartford has changed a number of its passenger engines into anthracite burners. Coincident with this announcement the newspapers publish a despatch from New Haven in which President Mellen is made to say that the company finds it impracticable to burn anthracite. He says that even the railroads in the anthracite region have to use bituminous coal to make steam on their fast passenger trains. Every effort will be made to reduce the smoke nuisance, but he plainly intimates that on the lines where the freight traffic is heavy, the people must expect to submit to some smoke.

On the occasion of the army manœuvres in Prince William County, Virginia, September 5-10, the Southern Railway moved to the several camps 1,107 cars of men, horses and baggage, in 91 trains; and the arrangements were so carefully made in advance that there was no serious delay; and the whole movement both to and from the camp was accomplished without a mishap. At camp No. 2, near Thoroughfare, Va., the railroad company laid 26 side tracks each 2,700 ft. long; and equally elaborate preparations were made at the other camps. The troops gathered on this occasion numbered about 30,000 men, and they had 2,600 horses and mules. Besides the military forces, a large number of visitors were carried to and from the camp each day.

On the Mobile & Ohio the rear trainman of every passenger train running at night is required to keep a record of the switch lamps passed, and to this end must remain on the rear end of the train at all times except in case of emergency or when it is necessary to go out with red signals. A report has to be sent to the trainmaster for each trip, and the trainmaster forwards the reports to the division superintendent. A blank of a suitable form is provided for the use of the brakemen. Reports from passenger train enginemen of defective fixed signals, or lamps not burning, are also made on a printed blank, which is sent, through the master mechanic, to the superintendent.

Leonard's Railway News.

The publisher of this New York railroad weekly announces that beginning next Tuesday the paper will be published daily. The editor proposes to give all of the latest local and telegraph railroad news in condensed and readable form.

Rubber Pavement.

After 20 years of continuous service, the rubber pavement laid in 1881 on the road under the Hotel at Euston Station, London, was removed. The original thickness of the pavement was 2 in. and on removal it was found that it had worn down from ⅝ in. to 1¼ in., the greatest wear occurring at the point where the horses first entered on the paved strips. The chief advantage of rubber pavement is that it is noiseless. It costs about 33 dollars per sq. yd.

B. & O. Dining Cars.

The Baltimore & Ohio has 25 dining cars in daily use, seven of them built within the last two years, averaging in cost about $20,000 each. Within the past few months the wages of the stewards have been increased and a premium placed on good service and attention to customers. A traveling chef has been employed, whose sole duty it is to inspect the kitchens and instruct the cooks in their work; and the service is so much improved that the receipts have increased. An officer of the road makes the incredible statement that heretofore these cars have shown a profit; but the service is to be kept at the highest possible standard, profit or no profit.

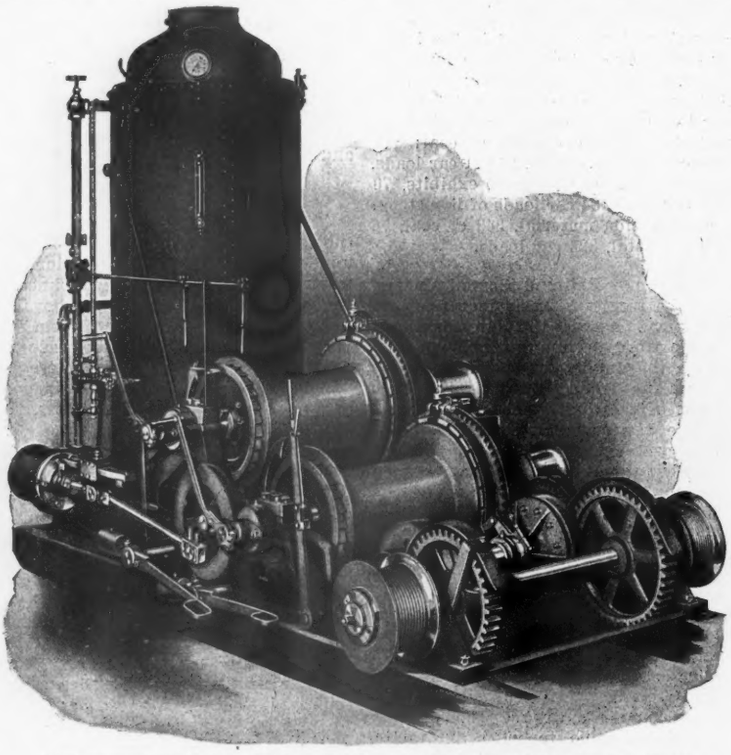
Training N. Y. C. Firemen.

The New York Central & Hudson River has decided to have firemen who desire to be promoted to the position of enginemen more thoroughly examined than heretofore, and a scheme has been adopted for having progressive examinations; one each at the end of the first, the second and the third year. Mr. Deems, the General Superintendent of Motive Power, who holds the same position on the Lake Shore & Michigan Southern, proposes to have the same plan adopted on the latter road. At each examination the fireman will be expected to grade 80 per cent. and can be dropped if he falls below that standard on either the first or second examination. If he fails on the third he is given two more chances. The first two examinations are held by a local committee of examiners which sits at the various division headquarters, but for the final examination the fireman has to go to the

headquarters of the line. New York Central and West Shore firemen will go to West Albany and Lake Shore firemen to Collinwood, Ohio.

The Lidgerwood New Boom Swinging Gear.

A new and improved boom swinging gear made by the Lidgerwood Manufacturing Company, New York, is shown in the accompanying illustration. This is the fourth swinging gear that this company has put upon the market and it is known as the No. 4 swing gear. It is employed for swinging the boom of any ordinary derrick simultaneously while the boom is being raised and the load hoisted. It consists of a drum shaft, two gear wheels, two drums and a friction shaft and two frictions and pinions mounted on side stands tied together by two flat steel braces secured to the bottom of the side stands and countersunk in them, making an independent apparatus which is mounted on an extension of the engine skids, and fastened to the front ends of the engine bed-plate. If desired the engine bed-plate may be extended and the swinging gear mounted on it. The friction shaft is driven by a pinion, next to the winch head on the forward drum shaft; this meshes with an idler gear which in turn drives a gear wheel keyed fast to the outer end of the friction shaft. There are two cone frictions on the friction shaft; the male part carrying the friction woods, is mounted on the shaft with a feather key, and the female part is cast with a pinion and mounted loosely on the shaft. The pinion of one drives a gear directly on the drum shaft, turning the drums in one direction while the pinion of the other drives an idler pinion which in turn drives the other gear on the drum shaft turning the drums in the other direction. The drums are spirally grooved and the ropes wind over on one drum and under on the other. When the female friction is moved into contact with one flange the rope is wound up on one drum and unwound on the other drum, and when the other friction is in contact the same thing occurs but in a reverse direction. The ropes being attached to the bull-wheel of the derrick it is thus swung in either direction. The frictions are applied by means of nuts, traveling on composition sleeves having screw threads which are mounted on the friction shaft and attached to an auxiliary shaft carrying the vertical operating lever. When this lever is in a central, or vertical, position neither friction is engaged, but when it is moved forward it causes one nut to travel on its screw and pushes one friction cone into engagement and at the same time the other nut releases the other friction cone. When the lever is moved back the reverse takes place. One of the swinging drums is keyed fast to the shaft and the other is loose and is prevented from turning by means of a collar keyed to the shaft on which are lugs or projections which fit into corresponding recesses in the drum. When the collar is loosened and moved back the drum may be revolved far enough to take up the slack due to the stretching of the rope and then the collar is moved back into place and secured. The drums being outside of the bearings the ropes leading to the bull-wheel do not interfere with the hoisting and boom lines.



Lidgerwood Hoisting Engine Equipped with a No. 4 Swinging Gear.

This gear is made on the duplicate part system and all parts are easy to get at. It occupies a small amount of space, does not add much to the weight of the engine, and can be operated easily and quickly. It can be placed upon any of the Lidgerwood standard double drum hoisting engines, either with or without boiler. A gear of this type is shown at the St. Louis Exposition in connection with the exhibit of the Lidgerwood Manufacturing Company.

Chicago Bridges.

The city officials of Chicago will ask bids this month for a trunnion bascule bridge (Ericson design) single-leaf 136-ft. span at Archer avenue to cost about $200,000, which includes a temporary pontoon bridge to carry street traffic during the construction of the bascule bridge; and will probably ask, in a few months, bids for a two-leaf trunnion bascule bridge (Ericson design) 172 ft. 8 in. between trunnions, at North avenue, to cost $240,000, which includes a ferry for carrying street traffic during the construction of the bridge; during next year a trunnion bascule bridge at North Halsted street over the North Branch canal, will probably be built.

The Sanitary District is building bridges at Eighteenth street and Harrison street, the contracts for which call for their completion January 1 and August 1, 1905, respectively.

The contract for the Twenty-second street bridge, which is to be a 261-ft. two-leaf through Scherzer bascule bridge, with 36-ft. roadway and two 8-ft. sidewalks, to cost about $255,500, calls for its completion by Dec. 1, 1905.

Bids have been asked for two swing drawbridges over the main canal on the Lockport extension; one to be a 310 ft. 3 in. counterbalanced swing span on the line of Ninth street, Lockport, and the other a 280-ft. similar span on the line of Sixteenth street. The total cost for both will be about $60,000.

Plans for a bridge at Dearborn street have been practically completed, but are held in abeyance pending a definite decision regarding the work of lowering the tunnels under the Chicago river, as a new tunnel under the river is contemplated at that point. The bridge, if built, will be similar to the State street bridge, with a span of about 164 ft. 6 in., with a clear channel width of 140 ft.

Exports and Imports of Iron and Steel.

According to the Summary of the Department of Commerce and Labor exports of ingots and blooms for the year ending June 30, 1904, amounted to 176,961 tons as compared with only 2,127 tons in the previous year. The exports of steel rails amounted to 160,894 tons as against 22,896 in the twelve months ending June 30, 1903. Of this large increase 75,350 tons went to British North America as against 15,738 tons the previous year, 12,906 tons went to Mexico as against 4,309 tons the previous year; 15,035 tons were exported to Japan as against 70 tons the previous year, and 38,206 tons were sent to Asia as compared with nothing the previous year. The total value of all iron and steel exports for the year was $254,873,565 as against $224,153,085 in the corresponding period of 1903. The report shows a large increase in the number of locomotives exported, 504 engines being sent to foreign countries as against 289 in 1903. Of this number, 74 went to Japan, 172 to British North America and 155 to Mexico. These figures compare with 32, 105 and 102 locomotives exported respectively to the same countries during the year ending June 30, 1903.

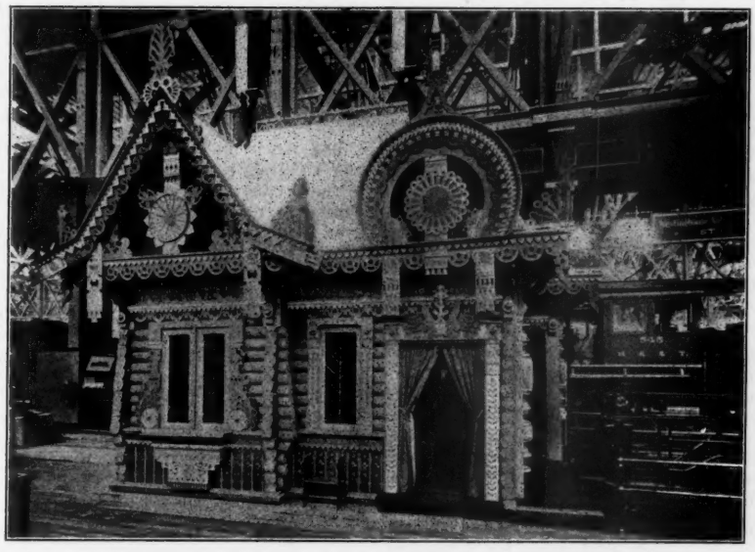
Imports of iron and steel show a large falling off. In the 12 months ending June 30, 1904, only 684,126 tons of iron ore were imported as against 1,043,565 tons during 1903. The imports of pig iron decreased from 956,198 tons to 191,135 tons. The heaviest decrease was in the imports of ingots, blooms and billets, which decreased from 850,026,997 lbs. to 206,074,443 lbs. The total value of all iron and steel imports during the 12 months ending June 30, 1904, amounted to only $27,028,436 as compared with $51,617,312 in 1903.

Second Electric Railroad in Peru.

The second electric railroad between Lima and Callao, Peru, is in operation. Like its predecessor, that between Lima and the seaside resorts, this road is equipped with American power and handsome American cars, both open and closed. It is run by the overhead trolley, and has lowered by one-half the fares formerly existing on the steam railroad.—*Consular Report.*

Russia's Building at the Fair.

There is only one Russian building at the Louisiana Purchase Exposition, and that is a pavilion in the Palace of Transportation. It was built by the Westinghouse Company, Limited, of St. Petersburg, and as a feature of the Westinghouse brake exhibits, is representative in every respect of Russian art and workmanship, and is the general Russian



Russian Westinghouse Companies' Building at the World's Fair.

rendezvous at St. Louis. The pavilion covers a space 20 ft. x 25 ft., and is 25 ft. high. It was built by peasant builders in the Possade Sergiewo, near Moscow, after designs by the native architect Baranowsky. Buildings of a similar character are still built in the interior of Russia, on a less elaborate plan, for small homes and pavilions. The style of construction is quite primitive, the exterior being that of a forest log cabin. The logs are neatly hewn and notched together so closely that no open joints remain to be plastered, as in American huts. The rafters of the high roof are also mortised into the plate, and no nails whatever are used in the construction. The fantastic taste of the peasants is indicated in the curiously sawn eaves, gables and cornices, which are elaborately ornamented and painted in the gayest colors. The material used throughout is a white pine from the forests around Moscow, the entire building having been shipped to this country in boxes. One entire wall is covered by a hand painted map of the world, by Ingenier Prochanof, with Russian text, the only large Russian map on the grounds, and Russian visitors are further attracted by files of newspapers and periodicals.

Collision at Hodges, Tenn.

Near Hodges, Tenn., on the Southern Railway, last Saturday, September 24, a butting collision of passenger trains resulted in the death of 59 passengers and trainmen and the injury of over 100 others, some fatally. The trains in collision were passenger train No. 15 westbound, from Bristol to Knoxville, and passenger train No. 12 eastbound, from Chattanooga to Salisbury. The westbound train disregarded an order to wait at Newmarket for the eastbound. The engineman of the westbound is among the killed. It is said that a large majority of the persons killed were in the forward passenger cars of the eastbound train, and that these cars, being of lighter construction than the sleeping cars in the rear of the same train, were crushed by the latter.

Canadian Railway Commission.

The Railway Commission of Canada has appointed J. H. Tessier Assistant Engineer, A. G. Blair, Jr., Law Clerk, and E. L. Lalonde, Inspector, to investigate railroad accidents. Mr. J. E. Duval, the Chief Inspector of the commission, was formerly Chief Train Despatcher of the Canada Atlantic at Ottawa. On September 3 Mr. Duval returned from a visit to Richmond, Quebec, where he had been to investigate the collision of August 31, and on the following Wednesday he took a little trip to Sintaluta, a trifle of 1,806 miles from the scene of the first-named accident, to investigate the derailment of the Imperial Limited on the Canadian Pacific.

Coal Production of the World.

A recent report of the British Board of Trade on the coal consumption of the principal countries of the world states that the total known production is now about 790 million tons per annum, of which the United Kingdom produces rather less, and the United States rather more than a third. The following statement shows the production of coal in the five principal coal-producing countries of the world in 1903 and the two previous years:

Years.	United Kingdom. Tons.*	Germany. Tons.†	France. Tons.†	Belgium. Tons.†	United States. Tons.*
1903.....	230,334,000	116,638,000‡	34,318,000‡	23,912,000‡	320,983,000
1902.....	227,095,000	107,474,000	29,365,000	22,877,000	269,277,000
1901.....	219,047,000	108,539,000	31,634,000	22,213,000	261,874,000

*Tons of 2,240 lbs. †Metric tons of 2,204 lbs.
‡Provisional figures.

Although the total production of the United States is in excess of the United Kingdom, the production, as compared with population, is greater there than in America, amounting to 5¼ tons per head, as compared with slightly less than four tons per head in this country. The consumption of coal in some of the chief consuming countries in the last two years was as follows:

	Tons	
	1903.	1902.
United States	316,029,000	265,694,000
United Kingdom	166,532,000	166,698,000
Germany	103,114,000	95,363,000
France	46,560,000	41,989,000
Russia	18,374,000	18,762,000
Belgium	21,432,000	19,799,000

The consumption per head of the population in the United States is now 3.93 tons of 2,240 lbs., which is exactly the same as in the United Kingdom, while in Belgium the figures are 3.07, Germany 1.75, and France 1.19 metric tons of 2,204 lbs. The consumption in Germany and France appears small, but in both those countries large quantities of other fuel, such as turf, wood, lignite, and denatured spirits, are also used.

The Lake Shore Record Haul.

In the *Railroad Gazette* of September 2 and 9 mention was made of a heavy train recently hauled over the Lake Shore & Michigan Southern between Youngstown and Ashtabula. Inasmuch as there has been some conflict in the published reports of these tests, the following data have been obtained from an officer of the road. On Tuesday, August 16th, engine 1,006 left Ashtabula with 65 steel hoppers loaded with ore and picked up five more when 17 miles out, making the total weight of the train, caboose and tender included, 5,164 tons; the 63 miles between Ashtabula and Youngstown was covered in 6 hrs. and 15 min. On Thursday, August 18th, the same engine left Youngstown with 80 cars of coal. The total weight of the train, including caboose and tender, was 5,421 tons; the time from Youngstown to Ashtabula was 5 hrs. and 20 min. On Friday, the 19th, the engine took 95 cars of coal from Youngstown to Ashtabula in 6 hrs. and 8 min. The total weight of the train, including caboose and tender, was 6,063 tons. On August 22nd, the engine left Youngstown with 100 steel hoppers loaded with coal, 6,836 tons, 600 lbs., and arrived at Ashtabula in 6 hrs. and 8 min. The caboose and tender is included in the weight of the train.

In the above figures the caboose and tender are included at 15 tons for the caboose and 73 tons for tender. The first three tests were in charge of Assistant General Superintendent, D. C. Moon.

Creosoted Ties in India.

Cross-ties are quite as expensive in India as anywhere else in the world judging from the fact the Bengal & Northwestern Railway has recently ordered a large number of creosoted pine ties from Norway and Sweden for use in building some new extensions. Metal ties and cast-iron pot supports have been used there for many years but near the coast or where the soil contains quantities of salt, they corrode very fast and last little if any longer than wooden ties. It is only within a few years that native hard woods have been experimented with to any extent, but at least one road is satisfied that quite as satisfactory ties can be cut from these woods as from timber grown out of the country. An extension of the East Indian Railway which is now being built will be laid with ties cut from pynkandu, a native hard wood. The greatest enemy of wooden ties in India is not the climate but the white-ant. When creosoted timber was first introduced it was claimed that these insects with their ravenous appetites would not attack the treated wood but this theory has been shattered utterly. A curious fact has been noted in the case of wooden cross-ties, and that is that the ants do not attack ties laid in the main track but destroy in a few months, those laid in sidings and other stretches of track which are little used. The constant vibration of the ties in the main track seems to effectually prevent the pests from burrowing deep

into the timber. Investigators have claimed that the white-ant will not attack any timber under stress, although they give no reason for such a claim.

Manufacturing and Business.

The Erie has given a large order for shapers to the Mark Flather Planer Co., of Nashua, N. H.

The American Blower Co., Detroit, Mich., has opened a branch office at 1019 Empire Building, Atlanta, Ga.

The Bethlehem Steel Works at South Bethlehem, Pa., were damaged by fire September 24 to the amount of about $75,000.

The Eclipse Rolling Mill Manufacturing Co., of Birmingham, Ala., will build a new forge shop 40 ft. x 60 ft. and put in new machinery.

The Goulds Manufacturing Co., of Seneca Falls, N. Y., it is reported, has bought 40 acres of land adjoining its works as a site for improvements.

Buck & Hickman, London, have the sole agency for all Great Britain for Mosso's "Monarch" tempering compound, made by C. A. Mosso, Dryden, N. Y.

The American Steel Foundries Co., it is reported, has bought the controlling interest in the works of the Commonwealth Steel Co., of St. Louis, for $2,000,000.

The Chandler Company, Ayer, Mass., has received from Vickers Sons & Maxim, Limited, of Sheffield, Eng., an order for a 36 in. x 36 in. x 10 ft. Chandler planer.

The Cleveland, Cincinnati, Chicago & St. Louis, it is said, will buy additional machinery for its shops at Bellefontaine and Delaware, Ohio, and Brightwood, Ind.

The Union Car, Truck & Construction Co., of Springfield, Mass., it is reported, has located a site for its works at Junction, N. J., on which a building will be put up at once.

H. S. Moulton, formerly Superintendent of the Allison Car Works at Philadelphia, Pa., is now representing the Fitz-Hugh-Luther Co. in New York City, with office at 141 Broadway.

The Welsh Machine Works, of New York City, has been incorporated with a capital of $50,000. The directors are: Frederick Welsh and Frank Teller, of New York, and Harry Young, of Brooklyn.

The McManus Manufacturing Co., of New York, has been incorporated with a capital of $25,000 to make iron and steel. The directors are: F. Wurtz, W. B. Orcutt and C. E. McManus, of New York.

The Independent Railroad Supply Co., Chicago, has recently received an order from the Santa Fe system for 25 miles of Wolhaupter rail joints. This is the second order the Santa Fe has placed for these joints.

The new double-deck twin screw ferry boat Wilkesbarre, of the Central of New Jersey, has been finished by the Harlan & Hollingsworth Co., of Wilmington, Del., and will soon be put in commission at New York.

The Lorain Steel Co. will put up an additional building with a frontage of 165 ft. and 250 ft. deep for its hammer, bolt, shear and truck shops, in addition to its present works in Johnstown, Pa., to cost about $90,000.

The Magee Collieries, of Corning, has been incorporated in New York to make iron and steel, with a capital of $100,000. The directors are: L. P. Miller and Oscar M. Rothfoss, of Corning, and J. C. Cowes, of Troy, N. Y.

The Pinar del Rio Railway & Iron Co. has been incorporated in Delaware with a capital of $1,000,000 by Joseph Bailey, of Patchogue, N. Y.; L. L. Bishop, West Hampton, N. Y.; F. D. Gillman, Chicago, and Louis G. Cone, of Havana.

Bids are wanted October 12 at the office of the Assistant Engineer of the Atlantic Coast Line at Jacksonville, Fla., for building three piers and wharves at Jacksonville. Plans are also on file at the office of the Chief Engineer in Wilmington, N. C.

The Indianapolis Drop Forging Co., of Indianapolis, Ind., will soon let contracts for new brick buildings to replace those recently destroyed by fire, to include a machine shop 50 x 250 ft., boiler house 35 x 50 ft. and a warehouse and office building 50 x 60 ft.

The Fay & Egan Co. has quickly recovered from the fire which recently damaged one of the erecting shops of the woodworking machinery plant at Cincinnati, and is filling orders as usual. A large part of the men have already resumed work and the remainder have been transferred to the company's other shops.

The Fort Worth Iron & Steel Manufacturing Co., of Fort Worth, has been incorporated in Texas, with a capital of $200,000, to build and operate a plant to make iron and steel products. The incorporators are: Ephraim Pickens, of Louisville, Ohio; W. Bryan and B. B. Paddock, of Fort Worth; John Devine, of Alliance, Ohio, and others.

The Binghamton (Tenn.) Car Works, which have been shut down for a year, resumed operations on September 15 under the new owner, the American Car & Foundry Co. It is the intention to increase the output from eight cars a day to 20 or 25. A large amount of new and improved machinery has been put in and the shops have been rearranged throughout.

The McClintic-Marshall Construction Co. has recently received an order from the Baltimore & Ohio for about 2,000 tons of plate girder bridges. The girder spans vary in length from 75 ft. to 110 ft. The portion of this order to be erected on the Pittsburg Division will be made at the Pittsburg plant, and the portion to be erected on the Baltimore Division at the Pottstown plant of the company.

Among the recent installations of the fan heating system in roundhouses by the B. F. Sturtevant Co., Hyde Park, Mass., are those at the Wabash roundhouses at St. Louis, Mo., and Montpelier, Ohio; the Pennsylvania roundhouse at Philadelphia, Pa.; the Illinois Central at Chicago, Ill.; the Chicago, Milwaukee & St. Paul at Galewood, Ill.; and nine roundhouses on the lines of the Canadian Pacific.

Mr. Van Alstyne, Engineer of the State of New York, announces that on the acceptance by the State Canal Board of the plans and specifications prepared by him for the barge canal, which he expects will occur this week, he will advertise for bids for the work on sections Nos. 1, 2, 3, 4, 5 and 6; and he thinks, therefore, that work on the canal will probably be begun by the end of this year. The advertisement has to be published four weeks.

The Chicago Tool & Supply Co., Chicago, as a result of increased business, has moved from the Monadnock Building into larger quarters at 356 Dearborn street. The entire seventh floor of the building has been taken and will be occupied by the general offices and an exhibit room. A complete pneumatic tool plant, consisting of a Blaisdell motor-driven air compressor, Green pneumatic hammer, Dunlap piston air drills, rock drills, stone tools, etc., will be shown in operation.

Iron and Steel.

The Republic Iron & Steel Co., it is reported, has given a contract to the Lloyd-Booth Co., of Youngstown, Ohio, for building its new structural mill at that place, to cost about $250,000.

The Carnegie Steel Co., one of the constituent companies of the United States Steel Corporation, it is said, has the contract for about 10,000 tons of structural steel for the big power house of the Edison Co., of New York, which will cost about $5,000,000, and is to be finished by October of next year. The material will be rolled at the Carnegie mills and delivered next spring and summer.

The American Iron & Steel Association has received practically complete statistics of the production of open-hearth steel in the United States in 1903, which is larger than ever before. The total production of open-hearth steel ingots and castings was 5,837,789 gross tons as against 5,687,729 tons in 1902. As compared with 1898, there was an increase of over 161 per cent. The open-hearth steel made in 1903 was produced by 111 works in 17 States. Ninety-eight works in 16 States made open-hearth steel in 1902. In 1902, 4,496,533 tons of open-hearth steel were made by the basic process, and 1,191,196 tons were made by the acid process, while in 1903, the production of the basic process amounted to 4,741,913 tons and the acid process to 1,095,876 tons.

Notice has been sent to the stockholders of the Colorado Fuel & Iron Co. announcing the annual meeting in Denver, October 17, and outlining a plan to take over all the properties lately sold by this company to stockholders and directors which have been conveyed to the Colorado Industrial Co., in which some of the directors of the Colorado Fuel & Iron Co. are interested. It is proposed to bring all these properties together under the control of the Colorado Fuel & Iron Co., to refund the outstanding first mortgage of this company and furnish it with a working capital. A proposition to amend the articles of incorporation of the C. F. & I. Co. will be made at the meeting to increase the capital stock from $40,000,000 to $46,200,000, to acquire the capital stock and part of the bonds of the Colorado Industrial Co., a corporation existing under the laws of Colorado, for which an issue of $6,200,000 of capital stock will be issued, and the mortgage bonds of the Industrial Co., for the amount of $45,000,000, are to be guaranteed by the C. F. & I. Co.

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad conventions and engineering societies see advertising page 30.)

Railway Club of Pittsburg.

The first meeting of this club since May was held September 23. A paper was presented by W. A. Herron, President of the Duquesne Steel Foundry Co., on "Steel Castings."

Railway Signal Association.

The annual meeting of this association will be held at St. Louis on Tuesday, October 11, beginning at 2 p.m. The place of meeting is in the large hall of the St. Louis Railway Club in the Transportation Building on the World's Fair grounds. The headquarters of the members while at the fair is at the Inside Inn, near the southeast corner of the Exposition grounds. Members desiring rooms at the Inn should engage them direct, in accordance with circulars already issued.

The Secretary of the association announces that committee reports will be mailed to members about October 1.

PERSONAL.

—Mr. Robert W. Downing, Comptroller of the Pennsylvania Railroad, will under the rule of the company retire in January next, having reached the age of 70. Mr. Downing was born in Philadelphia in 1835, and has been connected with the Pennsylvania since 1872. For a number of years previous to that he was Cashier and Auditor for several express companies.

—Mr. Leon F. Lonnbladh, the new Acting Engineer of Construction on the Tennessee Central, was born in Sweden in 1876. In 1898 he worked on surveys and locations for different new roads, and in 1900 was made Assistant Engineer on Construction on the Ystad-Brösarp Railroad in his native town. In 1902, Mr. Lonnbladh came to the United States and took a position with the Tennessee Construction Company, which at that time was building the Western Division of the Tennessee Central Railroad. In 1903 he was made office engineer, and when the work was finished he became Assistant Engineer of the Tennessee Central. In August, shortly after the resignation of Mr. Philbrick, he was made Acting Engineer of Construction.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe (Coast Lines). I. C. Hicks has been appointed Master Mechanic, with headquarters at Albuquerque, N. Mex.

Atlantic & North Carolina.—J. W. Grainger has been elected President, succeeding Jas. A. Bryan. D. J. Broadhurst has been appointed Secretary and Treasurer, succeeding Matt Manly.

Baltimore & Ohio.—J. L. Crider, hitherto Assistant Engineer at Baltimore, has been appointed Superintendent of Construction, with headquarters at Hazelwood Station, Pittsburg, Pa., succeeding E. P. H. Harrison, who has resigned to engage in private business.

Canadian Northern.—J. R. Cameron has been appointed Assistant Superintendent of the lines from Kamsack west, with headquarters at Kamsack, Assa.

Central of New Jersey.—W. F. Girten has been appointed General Foreman of Passenger and Freight Car Repairs, with office at Elizabethport, N. J., succeeding R. W. Burnett.

Chicago, Cincinnati & Louisville.—See Illinois, Iowa & Minnesota.

Cincinnati, Hamilton & Dayton—Pere Marquette.—C. A. Parker, hitherto Traffic Manager of the Colorado Fuel and Iron Co., has been appointed Vice-President in charge of Traffic of the C., H. & D., with headquarters at Cincinnati, Ohio, effective Oct. 1.

Denver & Rio Grande.—J. A. Edson, Manager, with office at Denver, Colo., has resigned, effective Oct. 1.

Galveston, Harrisburg & San Antonio.—See Southern Pacific.

Houston & Texas Central.—W. L. Bisbee, Superintendent at Houston, Tex., has been transferred to Austin as Superintendent, succeeding J. M. Lee, who has resigned, effective October 1. (See San Antonio & Gulf). Also see Southern Pacific.

Illinois, Iowa & Minnesota.—B. H. Harris, hitherto Freight Traffic Manager of the Chicago, Cincinnati & Louisville, has been appointed Traffic Manager of the I., I. & M., effective Oct. 1.

Missouri Pacific.—William Cotter, Manager, has resigned. (See Pere Marquette.)

New York, New Haven & Hartford.—C. T. Howe has been appointed Master Mechanic, with headquarters at South Boston, Mass., succeeding S. P. Willis; C. T. Sheldon succeeds L. M. Butler as Master Mechanic at Valley Falls, R. I., and W. L. Larry becomes Master Mechanic at Taunton, Mass., succeeding A. W. Twombly.

Northern Pacific.—H. H. Warner, Master Mechanic at Seattle, Wash., has resigned.

Oregon R. R. & Navigation.—Richard Koehler, hitherto Manager of the Southern Pacific lines in Oregon, has been appointed General Purchasing Agent of the O., R. R. & N. and the S. P. lines in Oregon, with headquarters at Portland, Ore. The office formerly held by Mr. Koehler has been abolished.

Pennsylvania.—M. Riebenack, hitherto Assistant Comptroller, will on January next succeed R. W. Downing as Comptroller, who is to be placed on the retired list, having served in that capacity for the past 32 years.

Peoria & Pekin Union.—William Hassman has been appointed Master Mechanic, with headquarters at Peoria, Ill.

Pere Marquette.—William Cotter, hitherto Manager of the Missouri Pacific, has been appointed General Manager of the P. M., effective Oct. 1.

San Antonio & Gulf.—J. M. Lee, hitherto Superintendent at Austin, Tex., of the Houston & Texas Central, has been appointed General Manager of the S. A. & G., with headquarters at San Antonio, Tex.

San Pedro, Los Angeles & Salt Lake.—The headquarters of E. W. Gillett, General Freight and Passenger Agent, have been removed from Salt Lake City, Utah, to Los Angeles, Cal.

Seaboard Air Line.—At a meeting of the Board of Directors held Sept. 28, John Skelton Williams and J. W. Middendorf resigned as Directors and Charles A. Conant and N. S. Meldrum were elected to fill their places. Mr. Williams also resigned as a member of the Executive Committee, his successor being C. Sidney Shepard. The office of Chairman of the Board, held by Mr. Williams, was abolished, and the duties and powers of that office will devolve on James A. Blair as Chairman of the Executive Committee.

Southern Pacific.—See Oregon R. R. & Navigation.

Southern Pacific Lines in Texas.—H. A. Jones has been appointed Freight Traffic Manager of the Houston & Texas Central, the Houston East & West Texas and the Houston & Shreveport. The position hitherto held by Mr. Jones, Freight Traffic Manager of the Texas & New Orleans, has been abolished. T. G. Beard has been appointed General Freight Agent of the T. & N. O., with headquarters at Houston, Tex., succeeding C. K. Dunlap, who has been appointed General Freight Agent of the H. & T. C., the H. E. & W. T. and the H. & S., with office at Houston, Tex., succeeding W. H. Taylor, who has in turn been appointed General Agent at Houston of those roads and the G., H. & N. and the G., H. & S. A. J. R. Christian has been appointed Assistant General Freight Agent of the H. & T. C., the H. E. & W. T. and the H. & S., with office at Houston.

Texas & New Orleans.—See Southern Pacific.

LOCOMOTIVE BUILDING.

The Arkansas Southern is in the market for five locomotives.

The Midland Valley is having two locomotives built at the Baldwin Locomotive Works.

The Erie has ordered six simple six-wheel (0-6-0) switching locomotives from the Cooke Works of the American Locomotive Co. These locomotives will weigh 145,000 lbs.; cylinders, 19 in. x 26 in.; diameter of drivers, 50 in.; straight top boiler, with a working steam pressure of 180 lbs.; heating surface, 1,879 sq. ft.; 290 charcoal iron tubes, 2 in. in diameter and 11 ft. 6 in. long; Worth Bros. steel fire-box, 113¾ in. long and 66 in. wide; grate area, 52 sq. ft.; tank capacity, 6,000 gallons of water and coal capacity, 12 tons.

CAR BUILDING.

The Rutland R. R. is asking prices on a number of freight cars.

The Central of Georgia is figuring on 250 ventilated box cars of 60,000 lbs. capacity.

The Pullman Company is asking bids on special equipment for from 200 to 500 freight cars.

The Atchison, Topeka & Santa Fe is having seven passenger coaches built by the Pullman Co.

The Superior Oil Works, Warren, Pa., have ordered three tank cars of 8,000 gallons capacity from the Bettendorf Axle Co.

The St. Louis Southwestern is reported to have ordered 15 coaches and 20 baggage cars from the American Car & Foundry Co.

Barney & Smith are reported to be asking prices for special equipment on one lot of 500 freight cars and on another lot of 2,000 cars.

The Southern Pacific and *Union Pacific* have jointly ordered 18 combination smoking and observation coaches from the Pullman Co.

The Cincinnati, Hamilton & Dayton is reported to have ordered 2,500 box cars and 1,500 coal cars from the American Car & Foundry Co.

The Chicago & Western Indiana is having the 28 coaches reported as ordered in our issue of September 9 built at the St. Charles Works of the American Car & Foundry Co.

The Minnesota Land & Construction Co., which is doing the construction work on the Duluth, Virginia & Rainy Lake Railroad, is figuring on building some cars as it needs them in its contracting work.

The Consolidated Ry. has placed orders for 30 new trolley cars. Half of these will be built by the Jewett Car Co. and the other half by John Stevenson & Co. The cars will be 40 ft. 10 in. long, 8 ft. 4 in. wide and 11 ft. 6 in. high.

The Detroit United Railway has ordered 25 double truck closed passenger cars from the J. G. Brill Co., of Philadelphia, and 25 double-truck closed passenger cars from the St. Louis Car Co., St. Louis, Mo. These cars will be 29 ft. long; date of delivery, January, 1905.

The Hocking Valley has ordered 25 box cars of 60,000 lbs. capacity from the American Car & Foundry Co. The special equipment includes: Simplex bolsters and brake beams, Magnus Metal Co.'s brasses, Buckeye couplers, Camel Co.'s doors, Hocking Valley standard draft rigging, McCord dust guards and journal boxes, Excelsior roofs and Railway Steel-Spring Co.'s springs.

The Central of Georgia has ordered eight first class and two combination 70 ft. passenger cars from the American Car & Foundry Co., to be delivered December 1 to 15. The special equipment includes: Diamond special brake beams, Westinghouse air-brakes, Janney-Buhoup couplers, Forsyth curtain fixtures, Pantasote curtain material, Central of Georgia draft rigging, Pintsch lights, Standard steel platforms, Railway Steel-Spring Co.'s springs, Pullman vestibules, and Standard steel wheels.

The Nashville, Chattanooga & St. Louis, as reported in our issue of September 23, is about to build 100 stock cars of 60,000 lbs. capacity at its Nashville shops. These cars will weigh 35,000 lbs., and measure 38 ft. long, 8 ft. 7 in. wide and 7 ft. 6 in. high. The special equipment includes: Commonwealth Steel Co.'s bolsters, Simplex brake beams, Westinghouse air-brakes, Tower couplers, N. C. & St. L. brasses, trucks, door fast-

enings, doors, dust guards and journal boxes; Thornburgh draft rigging, Railway Steel-Spring Co.'s springs, and Louisville Car Wheel Co.'s wheels.

BRIDGE BUILDING.

Clearfield, Pa.—The Grand Jury has recommended the building of a new bridge over the west branch of the Susquehanna River in Bell Township; also the building of a new bridge over Wilson Run in Newburg.

Collingwood, Ont.—Bids are being received by D. C. Barr for building two bridges over Underwood's Creek in the town of Collingwood, one at Third street and one at Sixth street.

The Town Council has decided to construct a new steel bridge over Underwood's Creek.

Delphi, Ind.—Bids are wanted October 3 by F. H. Engle, County Auditor, for building a bridge in Washington Township.

Harrisburg, Pa.—The State Board of Public Buildings & Grounds has given the following bridge contracts: Steel bridge over Conewago Creek, in York Co., to York Bridge Co., at $23,750; steel bridge over Penn's Creek, near Selinsgrove, to National Bridge Co., New York, for $43,500; steel bridge over Mahoning Creek, near Stuartson Furnace, Armstrong Co., to Nelson & Buchanan, Chambersburg, for $17,945. There were 26 proposals in all.

The board has approved the plans for a bridge over the Connoquessing Creek, in Butler County, and one over the Catawissa Creek, in Columbia County. Plans for a bridge to be built over the Nescopeck Creek, in Luzerne County, estimated to cost $15,000, and two bridges on the Penn's Creek in Union County, which are being made, will cost $9,500 and $9,000, respectively.

Larue, Ohio.—The Cleveland, Cincinnati, Chicago & St. Paul has decided to build a new bridge over the Scioto River to replace the present steel 100-ft. structure.

Mansfield, Ohio.—Separate bids are wanted October 15 by George H. Weidner, County Auditor, for building bridges in the following townships: Worthington, Butler, Madison, Springfield, Monroe and Sharon.

New Haven, Conn.—The annual report of the New York, New Haven & Hartford states that contracts have been let for the renewal of 107 bridges at various points on the line of this road to accomplish the standardization of its line for heavy traffic.

Norfolk, Va.—The Norfolk & Western, it is reported, will build a steel bridge with an electric draw, to replace the present bridge over the east branch of the Elizabeth River.

Norristown, Pa.—The Eyre Construction Co., of Philadelphia, has been awarded the contract for the steel superstructure of the bridge over the Perkiomen at East Greenville, their bid being the lowest. The bridge will be 700 ft. long; the steel part will be only 100 ft. long by 40 ft. wide, the balance being arched masonry.

Olathe, Kan.—The Kansas City, Burlingame & Western will build a large number of plate girder and truss bridges along the line of its road from Kansas City to Council Grove, including one large structure over the Neosho River at Council Grove. A. L. Hartridge, Olathe, Kan., is Chief Engineer.

Philadelphia, Pa.—Residents of the northwestern section of the city have petitioned the Council to pass an ordinance for the opening of Twenty-ninth street between Glenwood and Sedgely avenues, which includes the building of a bridge to cost about $125,000 over the tracks of the Pennsylvania at that point.

Roanoke, Va.—The Norfolk & Western has decided to build a viaduct to connect with the bridge now over Norfolk avenue at a cost of about $10,000.

Salem, Mass.—At a special meeting of the City Council September 20, it was decided to change the plans for the Jefferson avenue bridge, increasing its cost by about $10,000 over the appropriation of $20,000 made in March, 1903.

Springfield, Mass.—The Boston & Albany will build a steel bridge about 400 ft. long over the Chicopee River on its Athol branch.

Sunbury, Pa.—The Sunbury & Selinsgrove Electric Railway Co. purposes building a new bridge over the Susquehanna River at the foot of Bainbridge street.

Springfield, Ohio.—The Board of Public Service, at a recent meeting, adopted a resolution requesting the City Council to provide funds for building a new bridge over Buck Creek, on Water street, to replace the structure recently destroyed.

Tipton, Ohio.—The County Commissioners, it is reported, have under consideration the question of building an iron bridge over the Sandusky River at a cost of $10,000.

Toledo, Ohio.—Separate bids are wanted October 13 by the Board of County Commissioners for building two bridges in Sylvania Township, one in Washington Township and one in Oregon Township. D. T. Davies, Jr., is County Auditor.

Bids are wanted October 6 by the Board of County Commissioners for $75,000 of bonds, the proceeds to be used for bridge improvements and repairs in Lucas County.

Topeka, Kan.—The City Railway Co., it is reported, will at once give a contract for building a new steel bridge, to cost about $60,000.

Washington, D. C.—The District Commissioners will probably ask for an additionl $100,000 to place a 100-ft. draw in the Anacostia bridge, required by the War Department. An appropriation of $250,000 has already been authorized for this bridge.

Wichita, Kan.—It is reported that bids are wanted October 15 by the County Commissioners for a steel bridge in Kechi Township and for a steel bridge in Grant Township.

Winnipeg, Man.—Bids are wanted November 15 by W. G. Styles for building a bridge in the municipality of Rosser.

Other Structures.

Anderson, Ind.—The Indiana Union Traction Co., it is reported, has filed a bond for $25,000 guaranteeing to build its car shops at a cost of $150,000 at this place.

Cameron, W. Va.—The Baltimore & Ohio, it is reported, is making surveys for a site for shops, a roundhouse, etc.

Des Moines, Iowa.—The St. Joe, Albany & Des Moines, it is reported, has secured ground as a site for its new freight house, which will be a brick structure 45 ft. x 300 ft.

Ironton, Ohio.—The Norfolk & Western, it is reported, has submitted a proposition to the city officials to build a new union passenger station 200 ft. long, with train sheds, to cost about $40,000.

Jacksonville, Fla.—The Atlantic Coast Line, it is reported, is receiving bids for building a new warehouse here.

The Atlantic Coast Line is asking bids for building three piers 400 ft. long to carry three tracks, to be built on the St. Johns River.

New Orleans, La.—The Illinois Central is building a cotton shed 140 ft. wide x 1,720 ft. long, to cost about $60,000.

Newport, Ark.—The Missouri Pacific, it is reported, will make improvements at a cost of about $20,000 here, which includes a new freight house.

Rocky Mount, N. C.—The Atlantic Coast Line, it is reported, is planning to build additions to its shops to double their capacity.

Spokane, Wash.—The Oregon Railroad & Navigation Co., it is reported, has plans ready and the site selected on which it will build a new passenger station to cost about $200,000.

Superior, Wis.—At the annual meeting of the Terminal Co., to be held October 4, action will be taken on the question of building a new union passenger station.

Victoria, B. C.—The Sound Bridge & Dredging Co., of Seattle, Wash., has been given a contract for the foundation work on the Canadian Pacific Hotel at about $100,000. Plans are being made, and, when completed, bids will be asked for the superstructure, making the total cost about $750,000.

Wilmington, Del.—The Pennsylvania, it is reported, has asked bids for a large office building, to be located at Water and French streets.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

Alton & Southern.—Articles of incorporation have been filed by this company in Illinois with an authorized capital of $100,000. The principal office will be at Alton. P. B. Warren, W. J. Lawler and C. F. Matthews are named as incorporators.

Atchison, Topeka & Santa Fe.—Surveys are reported in progress for an extension from Tulsa, Ind. T., southwesterly to Shawnee, Okla. T., 70 miles. The new line will parallel the St. Louis & San Francisco between these points. Connection will be made with the Eastern Oklahoma division of the Santa Fe at Shawnee. The present southern terminus of the A., T. & S. F. is Owasso, Ind. T., and the connection between this point and Tulsa, 12 miles, is now being built. When these two lines are completed, the Santa Fe will have a direct line from Chicago via Kansas City to the Gulf. The Eastern Oklahoma division from Shawnee south connects with the Topeka, Santa Fe & Gulf division at Pauls Valley, Ind. T. (August 19, p. 65.)

Atlantic Coast Line.—Bids are now being received by E. P. Pleasants, Chief Engineer, for grading of the yard tracks at the proposed Jacksonville terminal. The work will also include the building of a number of wharves and piers.

Delta Southern.—This company has completed its organization and work is reported in progress on the proposed road from Elizabeth, Miss., in a northerly direction to Kuhns, in Bolivar County, about 27 miles. The contract calls for the completion of the first 10 miles by December 1. J. S. B. Thompson is President and E. D. Duncan Secretary, both of Greenville, Miss. (September 9, p. 87.)

Denver, Northwestern & Pacific.—Press reports state that this company will soon let a contract for building a two-mile tunnel through the continental divide near James Peak, Colo. The cost of the tunnel will be about $2,000,000. It is also stated that bids will be received on October 1 for grading the line between Arrowhead and Hot Sulphur Springs. This latter work will involve an expenditure of about $500,000. H. A. Sumner, Denver, Colo., is Chief Engineer. (September 16, p. 94.)

Des Moines, Iowa Falls & Northern.—Officers of this company announce that the company intends to build an extension from its present terminus at Iowa Falls northeast to Charles City, in Floyd County, Iowa, 110 miles. Surveys for this extension have been finished and work will be begun early in the spring. The line as located runs through the towns of Geneva, Vermont and Greene. It has also been decided to build a further extension, within the next two years, from Charles City east to a point on the Mississippi River near La Crosse, Wis. E. E. Ellisworth, Iowa Falls, Iowa, is President. (See Construction Supplement.)

Canadian Valley & Western.—A charter has been granted this company in Oklahoma Territory with power to build a railroad from Washita Junction southeast through Washita and Caddo counties to a connection with the Muskogee Union railroad near Stonewall, Ind. T., 150 miles. The head-

quarters of the company will be at Norman, Okla. T. E. R. Malone, Purcell, Ind. T., and W. H. Johnson and M. L. Brittain, of Norman, Okla T., are incorporators.

CLEVELAND, CINCINNATI, CHICAGO & ST. LOUIS.—This company has opened its new main line between Pana, Ill., and St. Louis, 97 miles. The new line shortens the distance 13 miles. From Pana to Hillsboro the old roadbed is followed, but from Hillsboro to St. Louis, a distance of 60 miles, a new road has been made. The maximum grade on the new route is 1 per cent. (May 13, p. 375.)

CHICAGO, JOLIET & IOWA.—Press reports state that 65 miles of the right of way for this road have been secured. The proposed route is from Chicago through Will, Kendall, La Salle, Stark and Warren counties to Monmouth, Ill. The western division is not definitely decided upon, but the present plan provides for a branch from Keithsburg, on the Mississippi River, to Muscatine, Iowa. It is stated that grading will shortly be begun. The headquarters of the company are at Chicago. (March 25, p. 248.)

CHICAGO SOUTHERN.—Articles of incorporation have been filed by this company in Illinois with an authorized capital of $100,000. Three routes are given in the articles of incorporation. The first is south from Chicago through the counties of Cook, Will, Kankakee, Iroquois and Paris. The other routes provide for branches from the main line to East St. Louis and to Salem. J. R. Walsh, Chicago, is the promoter of the road.

FLORENCE & CLIFTON.—Application has been made by this company for a charter to build a railroad from Florence, Ala., northwest to Clifton, Tenn., 40 miles. J. C. Janes, E. Watkins, R. W. Barr, and others, of Florence, Ala., are interested.

FRANKFORT & OHIO RIVER.—Articles of incorporation have been filed by this company in Illinois with an authorized capital of $50,000. It is proposed to build a railroad from West Frankfort, in Franklin County, Ill., through Williamson and Saline counties to a point on the Ohio River, in Gallatin County. The incorporators and first board of directors are: Jonathan Reeves, J. J. Duck, F. W. Krohn and H. F. Jones, all of Chicago.

ILLINOIS CENTRAL.—Press reports state that grading and double tracking are now in progress on a section about 6½ miles long between Halls and Fowlkes, Tenn. L. Montville, Memphis, Tenn., has the contract. This is part of the work of double tracking the entire line between Woodstock and Fowlkes, Tenn., 65 miles.

INTERCOLONIAL.—Bids will be received until October 6 for grading and widening the present roadbed preparatory to a second track between Rockingham, N. S., and Bedford, 10 miles, and also for a small amount of grading for double track at Birch Cove, near Rockingham. Plans and specifications may be seen at the Station Master's office at Bedford, N. S., and at the office of the Chief Engineer at Moncton, N. B.

JEFFERSON & ATHENS.—Application has been made by this company for a charter to build a railroad from Jefferson, Ga., southeast to Athens, 15 miles. Rights of way are now being secured and preliminary surveys are in progress. F. L. Pendergrass, Jefferson, Ga., is said to be interested.

JEFFERSON CITY, JERICO & SOUTHWESTERN.—This company has been authorized in Missouri with an authorized capital of $1,250,000 to build a railroad from Minden, in Barton County, northeast to Eldon, 125 miles. Connection will be made with the Rock Island and the Lebanon branch of the Missouri Pacific at Eldon. J. C. Long, R. E. Collins, E. R. Chappell and J. B. Myers are named as incorporators.

KANSAS CITY, BURLINGAME & WESTERN.—An officer writes that the proposed route of this road is from Kansas City, Mo., southwest through Olathe, Kan., Edgerton, Baldwin, Willow Springs and Burlingame to Council Grove, 131 miles. The maximum grade will be 1 per cent. and the maximum curvature 4 degrees. No contracts have as yet been let, but grading will probably be begun about the middle of October. There will be a number of wooden trestles and several plate girder and truss bridges, the largest of which will be over the Neosho River at Council Grove. Rights of way have been secured and surveys completed. A. L. Hartbridge, Olathe, Kan., is Chief Engineer. (September 16, p. 95.)

KANSAS, OKMULGEE & GULF.—A charter has been granted this company to build a railroad from Kansas City to a point on the Red River in the Choctaw nation, Okla. T. The authorized capital is $2,500,000, and the length of the line as projected is about 600 miles. W. W. Whitten, M. L. Bozarth and William Jackson, of Okmulgee, Ind. T., and W. R. Taylor, Oklahoma City, Okla. T., are said to be incorporators.

Paragould & Memphis.

KENTUCKY MIDLAND.—An officer writes that the proposed route of this road is from Madisonville, Ky., southeast to Central City, 26 miles. Contracts have not been let, as the work will be done by the company's forces. The character of the work is light, with 1½ per cent. grades and maximum curves of 6 degrees. There will be one steel bridge and about 4,000 ft. of trestles. Rights of way have been secured and final surveys completed, so that grading will be begun at once. P. J. Jennings, 221 Home Insurance Building, Chicago, Ill., is President, and M. M. Wheeler, Madisonville, Ky., is Chief Engineer. (September 2, p. 29.)

LAWRENCEVILLE & WESTERN.—An officer writes that this company has been incorporated in Virginia to build a railroad from Lawrenceville northwest to Cochran, 6 miles, where connection will be made with the Seaboard Air Line. No contracts have as yet been let, but the prospects of building are believed to be good. The work will not be difficult, as the country is level, with no streams to be crossed. E. P. Buford, Lawrenceville, Va., is President. (September 23, p. 103.)

LOUISVILLE & ATLANTIC.—It is officially denied that this company is planning to build an extension from Beattyville, Ky., to Prestonburg. All press reports to this effect are without foundation.

MASON & OCEANA.—According to press reports, the route of this proposed railroad is to be changed. The line, as it is now projected, is to run from Walkerville, Mich., through the Crystal Valley to Hesperia. Rights of way have been practically all secured and the line has been graded for a few miles out of Hesperia. M. F. Butters, Buttersville, Mich., is President. (See Construction Supplement.)

MEXICAN ROADS.—A concession has been granted by the Mexican Government to J. R. Wahl, of Mexico City, for building a railroad from Tepic to Santiago, on the west coast of Mexico. A branch is also projected to San Blas. The total length of the road will be about 80 miles.

According to press reports, arrangements have been completed for building a narrow-gage railroad between San Marcos, in the state of Temaulipas, and Berrizabal, about 35 miles. The road will be built in the interest of the Campania Ferrocarril de Cicunvalacion.

ONTONAGON & SOUTHWESTERN.—Work will soon be begun on the first five miles of this proposed railroad from Ontonagon, Mich., southwesterly to the Presque Isle River, 40 miles. The road will be built in the interest of the Ontonagon Lumber & Cedar Co. T. Nestor, Detroit, Mich., is President, and D. D. Nelson, Ontonagon, Mich., Secretary. (August 26, p. 74.)

PARAGOULD & MEMPHIS.—An officer writes that this company is now operating a line from Cardwell, Mo., to Manila, Ark., 24 miles. It is proposed to build the following extensions: From Cardwell north to Poplar Bluff, Mo., about 50 miles; from Cardwell west to Paragould, 12 miles; from Manila southwest to Marked Tree, 30 miles, and from Manila southeast to Osceola, 16 miles. No contracts have as yet been let, but it is proposed to begin grading soon. The character of the work is light. There will be two drawbridges. W. E. Winn is Chief Engineer; F. Quinn, General Manager, and J. E. Thomas, Second Vice-President, all of Cardwell, Mo. (September 2, p. 80.)

SAN PEDRO, LOS ANGELES & SALT LAKE.—A contract is reported let to the Utah Construction Co., of Ogden, Utah, for building an additional section of this road from Las Vegas to Good Springs, Nev., 37 miles.

SOUTH DAKOTA CENTRAL.—Press reports state that this company has completed the first 20 miles of its line from Sioux Falls, S. Dak., northwest to Colton. It is the intention of the company to eventually extend the line to Madison, 20 miles beyond Colton. P. F. Sherman, Sioux Falls, is President. (July 1, p. 24.)

SPRINGFIELD, WASHINGTON COURT HOUSE & CHILLICOTHE.—This company has recently been organized in Ohio to build a railroad from Springfield southeast through South Charleston, Washington C. H. and Greenfield to Chillicothe, 70 miles. H. L. Rockfield is President and E. H. Ackerson Secretary, both of Springfield, Ohio.

TEXAS & GULF.—A charter has been filed by this company with the Secretary of State of Texas. It is proposed to build a railroad from Timpson to a point on the Gulf of Mexico, about 150 miles, and also to a point on the northern border of the state of Texas, about 100 miles. The general state of the company is located at Longview, Tex. Grading is reported in progress in a northerly direction out of Timpson and rights of way are said to have been all secured. J. W. Yates, W. T. Whitelock, W. S. Mayfield and others, of Longview, Tex., are interested.

YAZOO & MISSISSIPPI VALLEY.—Press reports state that work is to be started at once on a branch line from Helm, Miss., north to Arnold, in Bolivar County, 20 miles. Surveys for this line are reported completed, and grading is to be begun at once. The new road will pass for miles through a fine timbered section, and will connect two branches of the Yazoo & Mississippi Valley.

RAILROAD CORPORATION NEWS.

Atchison, Topeka & Santa Fe.—The report of this company for the fiscal year ending June 30 shows gross earnings of $68,171,200, an increase of $5,820,802 over last year. Operating expenses increased $3,784,922, leaving an increase in net earnings of $45,880. The total mileage of the railroad was increased during the year 214 miles. Of this increase, 134 miles was due to the completion of the Eastern Oklahoma railroad. The strike of the miners in Colorado and New Mexico, which began in November last year, caused a loss to the railroad of about $1,500,000, due not only to a loss of freight, but also to the higher cost of fuel that it caused. The chief feature of the report is a notice to the stockholders of large future capital requirements. President Ripley states that since 1893, $30,000,000 out of the income of the road has been used for betterments and improvements; but prospects for future growth are so good that a large amount of second track will have to be built, and for this new capital will be required.

Delaware & Hudson.—Charles Sundstrom and F. M. Stratton have brought action against this company to recover $2,020,000. The firm of Sundstrom & Stratton had the contract for rebuilding the Chateaugay branch from Plattsburg, N. Y., to Lake Placid. The contract was completed in July of this year. The complainants allege that $2,020,000 is still due them. The papers in the case have been served upon the railroad, but no reply has as yet been made.

Grand Trunk Pacific.—President Hays and the party of directors who recently went west on an inspection trip have returned. Mr. Hays says that no decision will be reached as to the terminal on the Pacific coast until a report is received from the experts who are at present engaged in collecting data as to the approaches by land and water at various points between Port Simpson and Vancouver.

Minneapolis, St. Paul & Sault Ste Marie.—Over an average mileage worked of 1,530 miles as against 1,464 miles in 1903, this company shows gross earnings of $7,082,153 for the year. Although this is a decrease of $211,590 over 1903, it should be taken into consideration that last year was an unusually favorable year, the receipts being $1,036,152 more than in 1902, while 1904 was a poor year for the railroad owing to extremely unfavorable weather in North Dakota and along the Great Lakes. This caused a falling off of $267,259 in freight earnings, passenger receipts remaining about the same. Operating expenses for the year were $3,746,780, an increase of $26,858. Of this amount, the maintenance of equipment and conducting transportation accounts show increases of $69,616 and $45,549 respectively, while the maintenance of way charges were $95,000 less than in 1903. The largest specific decrease in this department was in renewals, which were far less extensive than in previous years. During the year the sum of $448,945 was expended for betterments and improvements to property, of which $200,000 was appropriated from the receipts of 1903, and $250,000 from this year's income. On Oct. 15, 1903, the company paid its first dividend out of the earnings of the calendar year 1902. These dividends amounted to 7 per cent. on the preferred stock and 2 per cent. on the common. In April, 1904, a second dividend of 3½ per cent. on the preferred and 2 per cent. on the common was paid. The equipment was increased by the purchase of 15 locomotives and five passenger cars; and some second-hand equipment was received with the Bismarck, Washburn & Great Falls. During the year, 103 miles of new track was laid, consisting of an extension from Birchwood, Wis., to Reserve, 19 miles, and an extension from Glenwood, Minn. (northward toward Winnipeg) to a point eight miles south of Detroit, Minn., 84 miles; and 75 miles was bought; from Rex, Mich., to Mead's Quarry, 15 miles, and the Bismarck, Washburn & Great Falls Railroad between Bismarck and Underwood, N. Dak., 60 miles. The more important statistics of operation follow:

	1904.	1903.
Average mileage worked ..	1,529	1,463
Gross earnings	$7,082,153	$7,293,743
Freight earnings	4,987,476	5,254,735
Passenger earnings	1,523,262	1,524,378
Other earnings	256,240	251,223
Operating expenses	3,746,780	3,719,922
Conducting transportat'n	2,143,576	2,098,027
Maint.-of-way and struc.	705,517	800,792
Maint. of equipment....	730,674	661,058
Net earnings	3,335,373	3,573,820

New York, New Haven & Hartford.—This company has bought the Worcester & Blackstone Valley Street Railroad, which operates a line from Worcester, Mass., south to Whitinsville, 17 miles. The purchase price is not stated. This makes the third street railroad entering Worcester which has been bought by the New Haven during the past year. The other two are the Worcester & Webster and the Worcester & Southbridge. All of them parallel New Haven steam lines more or less closely.

New York, Westchester & Boston.—Application has been made by this company to the New York State Railroad Commissioners for leave to issue $19,000,000 stock and $20,000,000 bonds. The application has been opposed by the Van Nest Land & Improvement Co. and the New York & Port Chester Railroad on the ground that its legality is doubtful.

Philadelphia Rapid Transit.—The report of this company for the fiscal year shows that gross earnings were $16,096,363, an increase of $659,789; but as there was a corresponding increase in operating expenses the gain in net receipts amounted to only $220,850. The report states that work on the Market street subway is progressing favorably and that the south track has been completed from Twenty-third street to Nineteenth street. The grading from Twenty-second street to the bridge across the Schuylkill river will be finished this fall. The piers for this bridge are now finished.

Pittsburg, Cincinnati, Chicago & St. Louis.—Kuhn, Loeb & Co. and Speyer & Co., of New York, have jointly bought $9,000,000 consolidated first-mortgage refunding 4 per cent. bonds of this company. These bonds are a part of an authorized issue of $75,000,000.

Portland & Rumford Falls.—The gross earnings of this road for the fiscal year ending June 30, 1904, were $583,399, a decrease of $39,620. Operating expenses were $309,364, a decrease of $37,809, leaving a decrease in net for the year of $1,811. The loss in freight earnings was caused principally by extremely low water last winter. Income from other sources increased $17,531, making total net income $309,159, or $5,721 more than in 1903.

Toledo, Peoria & Western.—The report for the fiscal year ending June 30, 1904, shows gross earnings of $1,308,716, an increase of $68,743 over 1903. Freight earnings increased $53,900 and passenger earnings $7,093. Owing to additions and renewals to equipment, operating expenses were somewhat higher, being $1,076,020, an increase of $64,186, leaving a gain in net for the year of $4,557.

Vera Cruz & Pacific.—Kuhn, Loeb & Co., bankers, of New York, have filed a bill in the circuit court in Baltimore protesting against the recent sale of the bonds of this road to Speyer & Co. by the receiver. In the petition, it is claimed that the bonds were sold at a private sale for 88½ and the court is asked not to ratify the sale. Kuhn, Loeb & Co. make a formal offer of 90 for all the bonds. An offer for the bonds is also made by Baring, Magoun & Co., of New York, of 90.26, with accrued interest.

Worcester & Blackstone Valley (Street).—See New York, New Haven & Hartford above.

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CONTRIBUTIONS.—Subscribers and others will materially assist in making our news accurate and complete if they will send early information of events which take place under their observation. Discussions of subjects pertaining to all departments of railroad business by men practically acquainted with them are especially desired.

ADVERTISEMENTS.—We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay, EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and these only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers, can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially either for money or in consideration of advertising patronage.*

FRIDAY, SEPTEMBER 30, 1904.

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